KAWERAK, INC.

Kawerak, Inc. Request for Proposal

Savoonga Reindeer Processing Facility

DUE JULY 12, 2024 at 12:00 p.m. AKDT

COMMUNITY PLANNING & DEVELOPMENT

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PROJECT TITLE PAGE

1.1 PROJECT MANUAL VOLUME 1

A. Project: Savoonga Reindeer Processing Facility
B. Owner: Savoonga Reindeer Commercial Company & Kawerak Inc.
C. Location: State of Alaska, Saint Lawrence Island, Native Village of Savoonga
D. Owner's Representative:

Coffman Engineers
301 W. Northern Lights Blvd.
Suite 200
Anchorage AK, 99503
Phone: 907.276.6664

E. Architect:

MCG Explore Design
421 W 1st Ave #300
Anchorage, AK 99501
Phone: 907.563.8474

F. Website: www.exploredesign.com
G. Issued: June 7, 2024
H.

END OF SECTION 00 01 01

SECTION 00 11 13
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.

B. Project Identification:

1. Project Name: Savoonga Reindeer Processing Facility
2. Project Location: Savoonga, Alaska, St. Lawrence Island

C. Co-Owners: Savoonga Reindeer Commercial Company & Kawerak Inc.
D. Owner's Representative: Coffman Engineers, Ed Leonetti, PLA
E. Architect: MCG Explore Design, Garrett Burtner, AIA

F. Project Description: Project consists of providing all material, labor, equipment, supplies, transportation, handling and storage and performing all operations in connection with the construction of a Reindeer Processing Facility. Scope is further defined as the construction of water and sewer mainline extension; water, sewer and electric service connections, building pad, and foundation systems. Pre-fabricated units and support building will be placed on gravel pad with foundations. The existing reindeer main corral located ~35 miles east of Savoonga will be replaced to include a neck, pens, and fawn filters. A storage shed will be constructed at the main corral.

G. 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: July 12, 2024
2. Bid Time: 12:00 p.m. AKDT local time.
3. Location: Coffman Engineers, Attention Ed Leonetti. Responses may be emailed to ed.leonetti@coffman.com or alternatively, hand deliveries may be made in person to Coffman Engineers at 301 W. Northern Lights Blvd., Anchorage AK, 99503.

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 90 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 Prebid meeting for all bidders will be held at via teams meeting on June 21, 2024 at 10:00 a.m., local time. Prospective prime bidders are requested to attend.

1.5 DOCUMENTS

A. Online Procurement and Contracting Documents: Obtain access after June 7, by contacting Owner's representative. Online access will be provided to all registered bidders and suppliers.

1.6 TIME OF COMPLETION

A. Successful bidder shall begin the Work on receipt of the Notice to Proceed and shall complete the Work within the Contract Time.

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.

1.8 NOTIFICATION

A. This Advertisement for Bids document is issued by Coffman Engineers.

END OF SECTION 00 11 13

SECTION 00 22 13
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**.**
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.

B. The following items are included in the bid package:

1. Project shall be substantially complete by September 15, 2025 and closed out by October 31 2025 in accordance A101-2017 draft contract.
2. Contractor shall provide builders risk insurance for the duration of the project.
3. All change orders shall have a maximum overhead and profit mark up of 12% for the General Contractor and 13% for subcontractors.
4. Current prevailing Davis-Bacon wage rate determination.

    a. https://sam.gov/wage-determination/AK20240001/0

5. “EDA Contracting Provisions for Construction Projects”
6. EDA “Notice of Requirements for Affirmative Action.” (EDA Grant Recipient must fill out this form with the appropriate information).
7. Lobbying Restriction Form (Form CD-512). (Required for all contracts in which Federal funds exceed $100,000)
8. EDA Sign Specifications.
9. Federal Participation Disclosure – “This project will be partially funded with Federal funds from the United States Department of Commerce, Economic Development Administration and therefore is subject to the Federal laws and regulations associated with that program.” (*This statement is usually added to Instructions To Bidders*).
10. Proposal/Bid Form
11. Unexecuted Contract/Agreement.
12. U.S. Fish and Wildlife Service letter dated March 15, from Kaithryn Ott, Lead Section 7 Biologist, page 2 Minimization measures for Polar bears,

1) Contractor shall maintain compliance with the following Best Management Practices:
   a) Ensure that all animal parts from the slaughter process are disposed of in a way that they are not accessible to bears.
   b) Be aware that garbage, food, deliberate feeding, animal carcasses, chemicals, petroleum products, sewage, and grey water can attract polar bears. Polar bears are curious and may also be attracted to novel or unfamiliar items (e.g., plastic objects)
   c) Store attractants in a manner that minimizes odors and prevents access by bears. Use bear-resistant storage containers and waste receptacles (see information at http://www.igbconline.org/html/bear-resistant-products). Always store food away from living quarters.
   d) Maintain clean work areas and/or camps.
   e) Clean any fuel spills or spills/leaks of other chemicals or toxic materials properly and immediately, even if they are small.
   f) When travelling, avoid carrying strongly scented attractants or store them in air-tight containers to minimize odor transmission, and consume food in enclosed and secure areas whenever possible.

13. To ensure ground-disturbing activities do not result in “take” of an active nest or migratory bird protected under the Migratory Bird Treaty Act, schedule all vegetation removal, trimming, and grading of vegetated areas outside of the peak bird breeding season to the maximum extent practicable. When project activities cannot occur outside the bird nesting season, conduct surveys prior to scheduled activity to determine if active nests are present within the area of impact and buffer any nesting locations found during surveys. Generally, the surveys should be conducted no more than five days prior to scheduled activity.
14. Processing modules footprint shown in bid package is preliminary and will be updated prior to bid closing.
15. Contractor shall furnish and install the incinerator and associated (4) pile foundations, which shall be located on the campus site. Final location on campus site will be identified prior to bid closing.

1.3 ARTICLE 1 - DEFINITIONS

1.4 ARTICLE 2 - BIDDER'S REPRESENTATIONS

A. Add Section 2.1.3.1:

1. 2.1.3.1 - 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. Add Section 2.1.5:

1. 2.1.5 - The Bidder is a properly licensed Contractor according to the laws and regulations of Alaska and meets qualifications indicated in the Procurement and Contracting Documents.

C. Add Section 2.1.6:

1. 2.1.6 - 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.

1.5 ARTICLE 3 - BIDDING DOCUMENTS

A. 3.2 - Interpretation or Correction of Procurement and Contracting Documents:

1. Add Section 3.2.2.1:

a. 3.2.2.1 - Submit Bidder's Requests for Interpretation.

B. 3.4 - Addenda:

1. Delete Section 3.4.3 and replace with the following:

a. 3.4.3 - Addenda may be issued at any time prior to the receipt of bids.

2. Add Section 3.4.4.1:

a. 3.4.4.1 - Owner may elect to waive the requirement for acknowledging receipt of 3.4.4 Addenda as follows:

1) 3.4.4.1.1 - Information received as part of the Bid indicates that the Bid, as submitted, reflects modifications to the Procurement and Contracting Documents included in an unacknowledged Addendum.
2) 3.4.4.1.2 - Modifications to the Procurement and Contracting Documents in an unacknowledged Addendum do not, in the opinion of Owner, affect the Contract Sum or Contract Time.

1.6 ARTICLE 4 - BIDDING PROCEDURES

A. 4.1 - Preparation of Bids:

1. Add Section 4.1.1.1:

    a. 4.1.1.1 - Printable electronic Bid Forms and related documents are available from Owner’s Representative.

2. Add Section 4.1.8:

    a. 4.1.8 - The Bid shall include unit prices when called for by the Procurement and Contracting Documents. Owner may elect to consider unit prices in the determination of award. Unit prices will be incorporated into the Contract.

3. Add Section 4.1.9:

    a. 4.1.9 - 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.

4. Add Section 4.1.10:

    a. 4.1.10 **-** Bids shall include sales and use taxes. Contractors shall show separately with each monthly payment application the sales and use taxes paid by them and their subcontractors in the form indicated. Reimbursement of sales and use taxes, if any, shall be applied for by Owner for the sole benefit of Owner.

B. 4.3 - Submission of Bids:

1. Add Section 4.3.1.2:

    a. 4.3.1.2 - Include Bidder's Contractor License Number applicable in Project jurisdiction on the face of the sealed bid envelope.

C. 4.4 - Modification or Withdrawal of Bids:

1. Add the following sections to 4.4.2:

    a. 4.4.2.1 - 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.
    b. 4.4.2.2 - 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.

D. 4.5 - Break-Out Pricing Bid Supplement:

1. Add Section 4.5:

a. 4.5 - Provide detailed cost breakdowns no later than two business days following Owner’s Representative’s request.

1.7 ARTICLE 5 - CONSIDERATION OF BIDS

A. 5.2 - Rejection of Bids:

1. Add Section 5.2.1:

a. 5.2.1 - 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.

2. Restating for clarification section 5.3 Acceptance of Bids

a. 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 Interest.

3. Delete section 5.3.2 in its entirety and replace with: Unless otherwise prohibited by law, the Owner shall accept Alternates in the order shown 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.

1.8 ARTICLE 6 - POSTBID INFORMATION

A. 6.1 - Contractor's Qualification Statement:

1. Add Section 6.1.1:

a. 6.1.1 - Submit Contractor's Qualification Statement no later than two business days following Architect's request.

B. 6.3 - Submittals:

1. Add Section 6.3.1.4:

a. 6.3.1.4 - Submit information requested in Sections 6.3.1.1, 6.3.1.2, and 6.3.1.3 no later than two business days following Architect's request.

1.9 ARTICLE 7 - PERFORMANCE BOND AND PAYMENT BOND

A. 7.1 - Bond Requirements:

1. Add Section 7.1.1.1:

a. 7.1.1.1 - Both a Performance Bond and a Payment Bond will be required. The bid bond shall be 5% of the contract sum and a performance bond shall be 100% of the Contract sum. Any surety companies must be listed in Circular 570.

B. 7.2 - Time of Delivery and Form of Bonds:

1. Delete the first sentence of Section 7.2.1 and insert the following:

a. 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.

2. Delete Section 7.2.3 and insert the following:

a. 7.2.3 - Bonds shall be executed and be in force on the date of the execution of the Contract.

1.10 ARTICLE 8 - FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

A. See attached referenced contract

1.11 ARTICLE 9 - EXECUTION OF THE CONTRACT

A. Add Article 9:

1. 9.1.1 - 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 Owner's Representative in such number of counterparts as Owner may require.
2. 9.1.2 - 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. 9.1.3 - Unless otherwise indicated in the Procurement and Contracting Documents or the executed Agreement, the date of commencement of the Work shall be the date of the executed Agreement or the date that the Bidder is obligated to deliver the executed Agreement and required bonds to Owner.
4. 9.1.4 - 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 SECTION 00 22 13

SECTION 00 26 00
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 Owner's Representative. 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 10 days prior to date of bid opening.

2. Submittal Format: Submit three copies of each written Procurement Substitution Request, using CSI Substitution Request Form 1.5C.
3. Submittal Format: Submit Procurement Substitution Request, using format provided on Project Web site.

    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, from ICC-ES
        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. Provide certification by manufacturer that the substitute proposed is equal to or superior to that required by the Procurement and Contracting Documents, and that its in-place performance will be equal to or superior to the product or equipment specified in the application indicated.
    d. 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 SECTION 00 26 00

SECTION 00 41 13
BID FORM - STIPULATED SUM (SINGLE-PRIME CONTRACT)

BID INFORMATION

A. Bidder: _____.
B. Project Name: Savoonga Reindeer Processing Facility
C. Project Location: Savoonga, Alaska
D. Owner: SSRC & Kawerak Inc.
E. Owner Project Number: 07 79 07873
F. Architect: MCG Explore Design

CERTIFICATIONS AND BASE BID

G. 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 MCG Explore Design and Architect's consultants, having visited the site, and being familiar with all conditions and requirements of the Work, hereby agrees to furnish all material, labor, equipment and services, including all scheduled allowances, necessary to complete the construction of the above-named project, according to the requirements of the Procurement and Contracting Documents, for the stipulated sum of:

1. _____ Dollars ($_____).

Item No.	Description	Quantity	Unit	Unit Price	Amount
0001	Construct water & sewer mainline extensions, complete*	1	Job	-	$_____
0002	Pad Development, pile foundation for processing modules, all utility connections to processing modules, as shown on C-101 complete,	1	Job	-	$_____

0003	Containerized Incinerator, shipping, installation, testing and training complete	1	Job	-	$_____
0004	Shipping and installation of Processing Modules	1	Job	-	$_____
				Total of Base Items 0001 thru 0004	$_____

BID GUARANTEE

H. 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 **90** 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 ($_____).

I. 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.

SUBCONTRACTORS AND SUPPLIERS

J. The following companies shall execute subcontracts for the portions of the Work indicated:

1. Concrete Work:_____.
2. Masonry Work: _____.
3. Roofing Work:_____.
4. Plumbing Work_____.
5. HVAC Work:_____.
6. Electrical Work: _____.

TIME OF COMPLETION

K. 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 Owner and shall fully complete the Work by October 31st, 2025.

ACKNOWLEDGEMENT OF ADDENDA

L. 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 _____.

BID SUPPLEMENTS

M. 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).

CONTRACTOR'S LICENSE

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

SUBMISSION OF BID

O. Respectfully submitted this ____ day of _____, 2024.
P. Submitted By:_____
(Name of bidding firm or corporation)
Q. Authorized Signature:_____
(Handwritten signature)
R. Signed By:_____
(Type or print name)

S. Title:_____
(Owner/Partner/President/Vice President)
T. Witnessed By:_____
(Handwritten signature)
U. Attest:_____
(Handwritten signature)
V. By:_____
(Type or print name)
W. Title:_____
(Corporate Secretary or Assistant Secretary)
X. Street Address:_____
Y. City, State, Zip:_____
Z. Phone:_____
AA. License No.:_____
BB. Federal ID No.:_____
(Affix Corporate Seal Here)

END OF SECTION 00 41 13

SECTION 00 43 13
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 A310-2010 "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 SECTION 00 43 13

SECTION 00 43 23
ALTERNATES FORM

1.1 BID INFORMATION

A. Bidder: _____.
B. Prime Contract: _____.
C. Project Name: Savoonga Reindeer Processing Facility
D. Project Location: Saint Lawrence Island, Savoonga Alaska
E. Owner: Savoonga Reindeer Commercial Company & Kawerak Inc.
F. Architect: MCG Explore Design.

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 will award the alternates in the order they are shown 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. 001: Construct Corall Complete:

1. ADD____ DEDUCT____ NO CHANGE____ NOT APPLICABLE____.
2. _____ Dollars ($_____).

B. Alternate No. 002: Construct corral support building, foundations complete:

1. ADD____ DEDUCT____ NO CHANGE____ NOT APPLICABLE____.
2. _____ Dollars ($_____).

C. Alternate No. 003: Construct Campus Storage building, foundations, complete:

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:_____(Insert 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 SECTION 00 43 23

SECTION 00 43 93
BID SUBMITTAL CHECKLIST

1.1 BID INFORMATION

A. Bidder: _____.
B. Prime Contract:_____.
C. Project Name: Savoonga Reindeer Processing Facility
D. Project Location: State of Alaska, Saint Lawrence Island, Native Village of Savoonga
E. Co-Owners: Savoonga Reindeer Commercial Company & Kawerak Inc.
F. Owner’s Representative: Coffman Engineers
G. Architect: MCG Explore Design

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 name of Prime Contract being bid, if applicable.
10. Bid envelope shows time and day of Bid Opening.
11. Verified that the Bidder can provide executed Performance Bond and Labor and Material Bond.
12. Verified that the Bidder can provide Certificates of Insurance in the amounts indicated.

END OF SECTION 00 43 93

SECTION 01 10 00
SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

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

B. Related Requirements:

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

1.3 DEFINITIONS

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

1.4 PROJECT INFORMATION

A. Project Identification: Savoonga Reindeer Processing Facility

1. Project Location: State of Alaska, Saint Lawrence Island, Native Village of Savoonga

B. Owner: SRCC & Kawerak Inc.

1. Owner's Representative:
Ed Leonetti
907.257.9290
ed.leonetti@coffman.com

C. Architect: MCG Explore Design

1. Architect's Representative: Garrett Burtner

D. Architect's Consultants: Architect has retained the following design professionals, who have prepared designated portions of the Contract Documents:

a. Survey: McKlintock & Associates
b. Civil Engineering: Coffman Engineers
c. Structural Engineering: Coffman Engineers
d. Mechanical Engineering: Coffman Engineers
e. Electrical Engineering: Coffman Engineers

E. Modular Contractor: Kometos has been engaged as Modular Contractor for this Project.

1. Modular Contractor Representative: Risto Salo

F. Web-Based Project Software: Project software will be used for purposes of managing communication and documents during the construction stage.

1. See Section 013100 "Project Management and Coordination." for requirements for using web-based Project software.

1.5 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and includes, but is not limited to, the following:

1. Project is partially funded with Federal funds from the United States Department of Commerce, Economic Development Administration and therefor is subject ot the Federal laws and regulations associated with that program.

2. Project is required to incorporate Davis-Bacon wage rate determination. The rate used for the project will be the published rate at the time of Bid closing.
3. EDA Contracting provisions for construction projects.
4. Lobbying Restriction form (Form CD-5125). Site Sign

1.6 WORK UNDER OWNER'S SEPARATE CONTRACTS

A. Concurrent Work: Owner will award separate contract(s) for the following construction operations at Project site. Those operations will be conducted simultaneously with Work under this Contract.

1. Alaska Village Electrical Co - Electrical Mainline extension to the project site. All service connections are the responsibility of General Contractor.

1.7 OWNER'S PRODUCT PURCHASE CONTRACTS

A. Owner has negotiated Product Purchase contracts with suppliers of material and equipment to be incorporated into the Work. Contractor shall include costs for shipping, receiving, handling, storage if required, and installation of material and equipment in the Contract Sum unless otherwise indicated.

1. Contractor's responsibilities are same as if Contractor had negotiated Product Purchase contracts.

B. Owner's Product Purchase Contracts Information:

1. Modular Processing Facility

a. Purchase Contract Firm and Representative: Kometos Co., Risto Salo
b. Product Purchase Contract Scope: Manufacturing of processing modules.
c. Product Purchase Status: Order placed and deposit paid by Owner.
d. Quantity: (1) One processing facility comprised of multiple modules.

1.8 OWNER-FURNISHED/CONTRACTOR-INSTALLED (OFCI) PRODUCTS

A. Owner's Responsibilities: Owner will furnish products indicated and perform the following, as applicable:

1. Provide to Contractor Owner-reviewed Product Data, Shop Drawings, and Samples.
2. Upon delivery, inspect, with Contractor present, delivered modular processing units.
3. Obtain manufacturer's inspections, service, and warranties.

4. Owner-furnished modules are projected to be fully manufactured and ready for shipping by January 1, 2025.

B. Contractor's Responsibilities: The Work includes the following, as applicable:

1. Designate delivery dates of Owner-furnished products in Contractor's construction schedule, utilizing Owner-furnished earliest available manufacture complete dates.
2. Review Owner-reviewed Product Data, Shop Drawings, and Samples, noting discrepancies and other issues in providing for Owner-furnished products in the Work.
3. Ship, receive, unload, handle, store, protect, and install Owner-furnished products by August 1, 2025.
4. Make building services connections for Owner-furnished products.
5. Protect Owner-furnished products from damage during shipping, storage, handling, and installation and prior to Substantial Completion.
6. Repair or replace Owner-furnished products damaged during shipment.

C. Owner-Furnished/Contractor-Installed (OFCI) Products:

1. Modular Processing Facility

1.9 CONTRACTOR'S USE OF SITE AND PREMISES

A. Unrestricted Use of Site: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.
B. Restricted Use of Site: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

C. Limits on Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Limits on Use of Site: Confine construction operations to areas where work is permitted.

2. Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.

a. Schedule deliveries to minimize use of driveways and entrances by construction operations.

b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

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

1.10 WORK RESTRICTIONS

A. Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work to between 7:00 a.m. to 7:00 p.m., Monday through Friday, unless otherwise indicated. Work hours may be modified to meet Project requirements if approved by Owner and authorities having jurisdiction.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging for temporary utility services according to requirements indicated:

1. Notify Owner not less than two days in advance of proposed utility interruptions.
2. Obtain Owner's written permission before proceeding with utility interruptions.

D. Noise, Vibration, Dust, and Odors: Coordinate operations that may result in high levels of noise and vibration, dust, odors, or other disruption to Owner occupancy with Owner.

1. Notify Owner not less than two days in advance of proposed disruptive operations.
2. Obtain Owner's written permission before proceeding with disruptive operations.

E. Smoking and Controlled Substance Restrictions: Use of**,** alcoholic beverages**,** and other controlled substances within the Village of Savoonga is not permitted.

F. Employee Screening: Comply with Owner's requirements for screening of Contractor personnel working on Project site.

    1. Maintain list of approved screened personnel with Owner's representative.

1.11 SPECIFICATION AND DRAWING CONVENTIONS

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

    1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
    2. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
    3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
    4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.

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

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

    1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
    2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings.

    3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (NOT USED)
PART 3 - EXECUTION (NOT USED)

END OF SECTION 011000

SECTION 01 25 00
SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.
B. Related Requirements:

1. Document 002600 "Procurement Substitution Procedures" for requirements for substitution requests prior to award of Contract.
2. Section 012100 "Allowances" for products selected under an allowance.
3. Section 012300 "Alternates" for products selected under an alternate.
4. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

A. Substitution Requests: Submit documentation identifying product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use form acceptable to Architect.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

    a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
    b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
    c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
    d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
    e. Samples, where applicable or requested.
    f. Certificates and qualification data, where applicable or requested.
    g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
    h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
    i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
    j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
    k. Cost information, including a proposal of change, if any, in the Contract Sum.
    l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
    m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor through

Construction Manager of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

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

1.6 PROCEDURES

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

1.7 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
b. Substitution request is fully documented and properly submitted.
c. Requested substitution will not adversely affect Contractor's construction schedule.
d. Requested substitution has received necessary approvals of authorities having jurisdiction.
e. Requested substitution is compatible with other portions of the Work.
f. Requested substitution has been coordinated with other portions of the Work.
g. Requested substitution provides specified warranty.
h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is

uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 days after the Notice of Award. Requests received after that time may be considered or rejected at discretion of Architect.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
b. Requested substitution does not require extensive revisions to the Contract Documents.
c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
d. Substitution request is fully documented and properly submitted.
e. Requested substitution will not adversely affect Contractor's construction schedule.
f. Requested substitution has received necessary approvals of authorities having jurisdiction.
g. Requested substitution is compatible with other portions of the Work.
h. Requested substitution has been coordinated with other portions of the Work.
i. Requested substitution provides specified warranty.
j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 2 - PRODUCTS (NOT USED)
PART 3 - EXECUTION (NOT USED)

END OF SECTION 012500

SECTION 01 29 00
PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.
B. Related Requirements:

1. Document 004373 "Proposed Schedule of Values Form" for requirements for furnishing proposed schedule of values with bid.
2. Section 012100 "Allowances" for procedural requirements governing the handling and processing of allowances.
3. Section 012200 "Unit Prices" for administrative requirements governing the use of unit prices.
4. Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
5. Section 013200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

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

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

2. Submit the schedule of values to Architect Owner’s Representative at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.

3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values coordinated with each phase of payment.

4. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values coordinated with each element.

5. Subschedules for Separate Design Contracts: Where the Owner has retained design professionals under separate contracts who will each provide certification of payment requests, provide subschedules showing values coordinated with the scope of each design services contract, as described in Section 011000 "Summary."

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. Identification: Include the following Project identification on the schedule of values:

   a. Project name and location.
   b. Owner's name.
   c. Owner's Project number.
   d. Name of Architect.
   e. Architect's Project number.
   f. Contractor's name and address.
   g. Date of submittal.

2. Arrange schedule of values consistent with format of AIA Document G703.
3. Arrange the schedule of values in tabular form, with separate columns to indicate the following for each item listed:

   a. Related Specification Section or division.
   b. Description of the Work.
   c. Name of subcontractor.
   d. Name of manufacturer or fabricator.
   e. Name of supplier.
   f. Change Orders (numbers) that affect value.

g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent. Round dollar amounts to whole dollars, with total equal to Contract Sum.

1) Labor.
2) Materials.
3) Equipment.

4. 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.

5. 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.

6. 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.

7. Purchase Contracts: Provide a separate line item in the schedule of values for each Purchase contract. Show line-item value of Purchase contract. Indicate Owner payments or deposits, if any, and balance to be paid by Contractor.

8. Overhead Costs, Proportional Distribution: Include total cost and proportionate share of general overhead and profit for each line item.

9. Overhead Costs, Separate Line Items: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.

10. Temporary Facilities: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.

11. 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.

12. 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.

1.5 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 Owner's Representative and paid for by Owner.

B. Payment Application Times: The date for each progress payment is indicated in the Owner/Contractor Agreement. 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 of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.

   1. Submit draft copy of Application for Payment seven days prior to due date for review by Architect.

D. Application for Payment Forms: Use AIA Document G702 as form for Applications for Payment.

   1. Other Application for Payment forms proposed by the Contractor may be acceptable to Architect and Owner. Submit forms for approval with initial submittal of schedule of values.

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

   1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
   2. Include amounts 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. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

F. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

   1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment for stored materials.
   2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.

3. Provide summary documentation for stored materials indicating the following:

    a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
    b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
    c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

G. Transmittal: Submit one signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

    1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

H. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.

    1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
    2. When an application shows completion of an item, submit conditional final or full waivers.
    3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
    4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
    5. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.

I. 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. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
    5. Products list (preliminary if not final).

6. Sustainable design action plans, including preliminary project materials cost data.
7. Schedule of unit prices.
8. Submittal schedule (preliminary if not final).
9. List of Contractor's staff assignments.
10. List of Contractor's principal consultants.
11. Copies of building permits.
12. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
13. Initial progress report.
14. Report of preconstruction conference.
15. Certificates of insurance and insurance policies.
16. Performance and payment bonds.
17. Data needed to acquire Owner's insurance.

J. 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.

        a. Complete administrative actions, submittals, and Work preceding this application, as described in Section 017700 "Closeout Procedures."

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

K. 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. Certification of completion of final punch list items.
    3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
    4. Updated final statement, accounting for final changes to the Contract Sum.
    5. AIA Document G706.
    6. AIA Document G706A.
    7. AIA Document G707.
    8. Evidence that claims have been settled.

9. 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.
10. Final liquidated damages settlement statement.
11. Proof that taxes, fees, and similar obligations are paid.
12. Waivers and releases.

PART 2 - PRODUCTS (NOT USED)
PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 31 00
PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project, including, but not limited to, the following:

1. General coordination procedures.
2. Coordination drawings.
3. RFIs.
4. Digital project management procedures.
5. Web-based Project management software package.
6. Project meetings.

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

C. Related Requirements:

1. Section 011200 "Multiple Contract Summary" for a description of the division of work among separate contracts and responsibility for coordination activities not in this Section.
2. Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
3. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
4. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.
5. Section 019113 "General Commissioning Requirements" for coordinating the Work with Owner's Commissioning Authority.

1.3 DEFINITIONS

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

1.4 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

    1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
    2. Number and title of related Specification Section(s) covered by subcontract.
    3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses, cellular telephone numbers, and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

    1. Post copies of list in Project meeting room, in temporary field office, in web-based Project software directory, and in prominent location in built facility. Keep list current at all times.

1.5 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.

    1. Schedule construction operations in sequence required to obtain the best results, where installation of one part of the Work depends on installation of other components, before or after its own installation.

2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Coordination of Multiple Contracts: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its own operations with 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 with other contractors to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

C. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

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

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

1.6 REQUEST FOR INFORMATION (RFI)

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

1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Owner name.
3. Owner's Project number.
4. Name of Architect.
5. Architect's Project number.
6. Date.
7. Name of Contractor.
8. RFI number, numbered sequentially.
9. RFI subject.
10. Specification Section number and title and related paragraphs, as appropriate.
11. Drawing number and detail references, as appropriate.
12. Field dimensions and conditions, as appropriate.
13. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
14. Contractor's signature.
15. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: Acceptable to Architect.

1. Attachments shall be electronic files in PDF format.

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

1. The following Contractor-generated RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for approval of Contractor's means and methods.
    d. Requests for coordination information already indicated in the Contract Documents.
    e. Requests for adjustments in the Contract Time or the Contract Sum.
    f. Requests for interpretation of Architect's actions on submittals.
    g. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect of additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 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 5 days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect
4. RFI number, including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

1.7 DIGITAL PROJECT MANAGEMENT PROCEDURES

A. Use of Architect's Digital Data Files: Digital data files of Architect's 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. Digital Drawing Software Program: Contract Drawings are available in PDF format.
4. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Architect.

    a. Subcontractors and other parties granted access by Contractor to Architect's digital data files shall execute a data licensing agreement in the form of Agreement acceptable to Owner and Architect.

B. Web-Based Project Management Software Package: Provide, administer, and use web-based Project management software package for purposes of hosting and managing Project communication and documentation until Final Completion.

    1. Web-based Project management software includes, at a minimum, the following features:

        a. Compilation of Project data, including Contractor, subcontractors, Architect, Architect's consultants, Owner, and other entities involved in Project. Include names of individuals and contact information.
        b. Access control for each entity for each workflow process, to determine entity's digital rights to create, modify, view, and print documents.
        c. Document workflow planning, allowing customization of workflow between project entities.
        d. Creation, logging, tracking, and notification for Project communications required in other Specification Sections, including, but not limited to, RFIs, submittals, Minor Changes in the Work, Construction Change Directives, and Change Orders.
        e. Track status of each Project communication in real time, and log time and date when responses are provided.
        f. Procedures for handling PDFs or similar file formats, allowing markups by each entity. Provide security features to lock markups against changes once submitted.
        g. Processing and tracking of payment applications.
        h. Processing and tracking of contract modifications.
        i. Creating and distributing meeting minutes.
        j. Document management for Drawings, Specifications, and coordination drawings, including revision control.
        k. Management of construction progress photographs.
        l. Mobile device compatibility, including smartphones and tablets.

        Provide up to seven Project management software user licenses for use of Owner.

2. At completion of Project, provide digital archive in format that is readable by common desktop software applications in format acceptable to Architect. Provide data in locked format to prevent further changes.

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

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

1.8 PROJECT MEETINGS

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

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times a minimum of seven days prior to meeting.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.

B. Preconstruction Conference: 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. Distribution of the Contract Documents.
m. Submittal procedures.

n. Sustainable design requirements.
o. Preparation of Record Documents.
p. Use of the premiseS.
q. Work restrictions.
r. Working hours.
s. Owner's occupancy requirements.
t. Responsibility for temporary facilities and controls.
u. Procedures for moisture and mold control.
v. Procedures for disruptions and shutdowns.
w. Construction waste management and recycling.
x. Parking availability.
y. Office, work, and storage areas.
z. Equipment deliveries and priorities.
aa. First aid.
bb. Security.
cc. Progress cleaning.

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

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other Sections and when required for coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.

2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

a. Contract Documents.
b. Options.
c. Related RFIs.
d. Related Change Orders.

e. Purchases.
f. Deliveries.
g. Submittals.
h. Sustainable design requirements.
i. Review of mockups.
j. Possible conflicts.
k. Compatibility requirements.
l. Time schedules.
m. Weather limitations.
n. Manufacturer's written instructions.
o. Warranty requirements.
p. Compatibility of materials.
q. Acceptability of substrates.
r. Temporary facilities and controls.
s. Space and access limitations.
t. Regulations of authorities having jurisdiction.
u. Testing and inspecting requirements.
v. Installation procedures.
w. Coordination with other work.
x. Required performance results.
y. Protection of adjacent work.
z. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 30 days prior to the scheduled date of Substantial Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

a. Preparation of Record Documents.
b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
c. Procedures for completing and archiving web-based Project software site data files.
d. Submittal of written warranties.

e. Requirements for completing sustainable design documentation.
f. Requirements for preparing operations and maintenance data.
g. Requirements for delivery of material samples, attic stock, and spare parts.
h. Requirements for demonstration and training.
i. Preparation of Contractor's punch list.
j. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
k. Submittal procedures.

l. Coordination of separate contracts.
m. Owner's partial occupancy requirements.
n. Installation of Owner's furniture, fixtures, and equipment.
o. Responsibility for removing temporary facilities and controls.

4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

E. Progress Meetings: Conduct progress meetings at weekly regular 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) Interface requirements.
2) Sequence of operations.
3) Resolution of BIM component conflicts.
4) Status of submittals.
5) Status of sustainable design documentation.
6) Deliveries.
7) Off-site fabrication.
8) Access.
9) Site use.
10) Temporary facilities and controls.
11) Progress cleaning.
12) Quality and work standards.
13) Status of correction of deficient items.
14) Field observations.
15) Status of RFIs.
16) Status of Proposal Requests.
17) Pending changes.
18) Status of Change Orders.
19) Pending claims and disputes.
20) Documentation of information for payment requests.

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

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

F. Coordination Meetings: Conduct Project coordination meetings at regular intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

    a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
    b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
    c. Review present and future needs of each contractor present, including the following:

        1) Interface requirements.
        2) Sequence of operations.
        3) Resolution of BIM component conflicts.
        4) Status of submittals.
        5) Deliveries.
        6) Off-site fabrication.
        7) Access.
        8) Site use.
        9) Temporary facilities and controls.
        10) Work hours.
        11) Hazards and risks.
        12) Progress cleaning.
        13) Quality and work standards.
        14) Status of RFIs.
        15) Proposal Requests.
        16) Change Orders.
        17) Pending changes.

3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (NOT USED)
PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 32 00
CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Startup construction schedule.
2. Contractor's Construction Schedule.
3. Construction schedule updating reports.
4. Daily construction reports.
5. Material location reports.
6. Site condition reports.
7. Unusual event reports.

B. Related Requirements:

1. Section 011200 "Multiple Contract Summary" for preparing a combined Contractor's Construction Schedule.
2. Section 012900 "Payment Procedures" for schedule of values and requirements for use of cost-loaded schedule for Applications for Payment.
3. Section 014000 "Quality Requirements" for schedule of tests and inspections.

1.2 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction Project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. Cost Loading: The allocation of the schedule of values for completing an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum.
C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine the critical path of Project and when activities can be performed.
D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
E. Event: The starting or ending point of an activity.
F. Float: The measure of leeway in starting and completing an activity.

    1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
    2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
    3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

G. Resource Loading: The allocation of labor and equipment necessary for completing an activity as scheduled.

1.3 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

    1. Working electronic copy of schedule file.
    2. PDF file.

B. Startup construction schedule.

    1. Submittal of cost-loaded startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.

C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.
D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1. Submit a working digital copy of schedule, using software indicated, and labeled to comply with requirements for submittals.

E. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports to contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

1. Activity Report: List of activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of preceding and succeeding activities for each activity, sorted in ascending order by activity number and then by early start date, or actual start date if known.
3. Total Float Report: List of activities sorted in ascending order of total float.
4. Earnings Report: Compilation of Contractor's total earnings from the Notice to Proceed until most recent Application for Payment.

F. Construction Schedule Updating Reports: Submit with Applications for Payment.
G. Daily Construction Reports: Submit at weekly intervals.
H. Material Location Reports: Submit at monthly intervals.
I. Site Condition Reports: Submit at time of discovery of differing conditions.
J. Unusual Event Reports: Submit at time of unusual event.

K. Qualification Data: For scheduling consultant.

1.4 QUALITY ASSURANCE

A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.

B. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's Construction Schedule, including, but not limited to, the following:

1. Review software limitations and content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.

3. Discuss constraints, including phasing, work stages, area separations, and interim milestones.
4. Review delivery dates for Owner-furnished products.
5. Review schedule for work of Owner's separate contracts.
6. Review submittal requirements and procedures.
7. Review time required for review of submittals and resubmittals.
8. Review requirements for tests and inspections by independent testing and inspecting agencies.
9. Review time required for Project closeout and Owner startup procedures**,** including commissioning activities.
10. Review and finalize list of construction activities to be included in schedule.
11. Review procedures for updating schedule.

1.5 COORDINATION

A. Coordinate Contractor's Construction Schedule with the schedule of values, list of subcontracts**,** submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities, and schedule them in proper sequence.

1.6 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

1. Use scheduling component of Project management software package specified in Section 013100 "Project Management and Coordination," for current Windows operating system.

B. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting, using CPM scheduling.

1. In-House Option: Owner may waive requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.
2. Meetings: Scheduling consultant to attend all meetings related to Project progress, alleged delays, and time impact.

C. Time Frame: Extend schedule from date established for the Notice of Award, the Notice to Proceed to date of Final Completion.

1. Contract completion date to not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

D. Activities: Treat each floor or separate area as a separate numbered activity for each main element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
2. Temporary Facilities: Indicate start and completion dates for the following as applicable:

    a. Securing of approvals and permits required for performance of the Work.
    b. Temporary facilities.
    c. Construction of mock-ups, prototypes and samples.
    d. Owner interfaces and furnishing of items.
    e. Interfaces with Separate Contracts.
    f. Regulatory agency approvals.
    g. Punch list.

3. Procurement Activities: Include procurement process activities for the following long lead-time items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
4. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
5. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
6. Commissioning Time: Include no fewer than 15 days for commissioning.
7. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
8. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and Final Completion.

E. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.
2. Work under More Than One Contract: Include a separate activity for each contract.

3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
6. Work Restrictions: Show the effect of the following items on the schedule:

    a. Coordination with existing construction.
    b. Limitations of continued occupancies.
    c. Uninterruptible services.
    d. Partial occupancy before Substantial Completion.
    e. Use-of-premises restrictions.
    f. Provisions for future construction.
    g. Seasonal variations.
    h. Environmental control.

7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

    a. Subcontract awards.
    b. Submittals.
    c. Purchases.
    d. Mockups.
    e. Fabrication.
    f. Sample testing.
    g. Deliveries.
    h. Installation.
    i. Tests and inspections.
    j. Adjusting.
    k. Curing.
    l. Building flush-out.
    m. Startup and placement into final use and operation.
    n. Commissioning.

8. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:

    a. Structural completion.
    b. Temporary enclosure and space conditioning.
    c. Permanent space enclosure.
    d. Completion of mechanical installation.
    e. Completion of electrical installation.

f. Substantial Completion.

F. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion**.**

G. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.

1. See Section 012900 "Payment Procedures" for cost reporting and payment procedures.

H. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered Requests for Information.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.
5. Pending modifications affecting the Work and the Contract Time.

I. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate Final Completion percentage for each activity.

J. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, equipment required to achieve compliance, and date by which recovery will be accomplished.

K. Distribution: Distribute copies of approved schedule to Architect Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

1.7 STARTUP CONSTRUCTION SCHEDULE

A. Gantt-Chart Schedule: Submit startup, horizontal, Gantt-chart-type construction schedule within seven days of date established for the Notice to Proceed.
B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

1.8 GANTT-CHART SCHEDULE REQUIREMENTS

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's Construction Schedule within 30 days of date established for the Notice to Proceed.

    1. Base schedule on the startup construction schedule and additional information received since the start of Project.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

    1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

1.9 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

    1. List of subcontractors at Project site.
    2. List of separate contractors at Project site.
    3. Approximate count of personnel at Project site.
    4. Equipment at Project site.
    5. Material deliveries.

6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Testing and inspection.
8. Accidents.
9. Meetings and significant decisions.
10. Unusual events.
11. Stoppages, delays, shortages, and losses.
12. Meter readings and similar recordings.
13. Emergency procedures.
14. Orders and requests of authorities having jurisdiction.
15. Change Orders received and implemented.
16. Change Directives received and implemented.
17. Services connected and disconnected.
18. Equipment or system tests and startups.
19. Partial completions and occupancies.
20. Substantial Completions authorized.

B. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

C. Unusual Event Reports: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, responses by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

1. Submit unusual event reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

PART 2 - PRODUCTS (NOT USED)
PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 32 33
PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Preconstruction photographs.
2. Concealed Work photographs.
3. Periodic construction photographs.
4. Time-lapse sequence construction photographs.
5. Final Completion construction photographs.
6. Preconstruction video recordings.
7. Periodic construction video recordings.
8. Time-lapse sequence construction video recordings.
9. Construction webcam.

B. Related Requirements:

1. Section 017700 "Closeout Procedures" for submitting photographic documentation as Project Record Documents at Project closeout.
2. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.
3. Section 024116 "Structure Demolition" for photographic documentation before building demolition operations commence.
4. Section 024119 "Selective Demolition" for photographic documentation before selective demolition operations commence.
5. Section 311000 "Site Clearing" for photographic documentation before site clearing operations commence.

1.2 INFORMATIONAL SUBMITTALS

A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph and video recording. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.
B. Digital Photographs: Submit image files within three days of taking photographs.

1. Submit photos by uploading to web-based Project management software site. Include copy of key plan indicating each photograph's location and direction.
2. Identification: Provide the following information with each image description in file metadata tag OR in web-based Project management software site:

    a. Name of Project.
    b. Name and contact information for photographer.
    c. Name of Architect.
    d. Name of Contractor.
    e. Date photograph was taken.
    f. Description of location, vantage point, and direction.
    g. Unique sequential identifier keyed to accompanying key plan.

C. Video Recordings: Submit video recordings within seven days of recording.

1. Submit video recordings by uploading to web-based Project management software site. Include copy of key plan indicating each video's location and direction.
2. Identification: With each submittal, provide the following in file metadata tag OR in web-based Project management software site:

    a. Name of Project.
    b. Name and contact information for photographer.
    c. Name of Architect.
    d. Name of Contractor.
    e. Date video recording was recorded.
    f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

3. Transcript: Prepared on 8-1/2-by-11-inch (215-by-280-mm) paper, punched and bound in three-ring binders. Provide label on front and spine. Include a cover sheet with label information. Include name of Project and date of video recording on each page.

D. Time-Lapse Video: Submit time-lapse sequence video recordings within two vgdays of recording.

1. Submit time-lapse sequence video recordings by uploading to web-based Project management software site.
2. Identification: For each recording, provide the following information on web-based Project management software site:

    a. Name of Project.
    b. Name and contact information for photographer.
    c. Name of Architect.

d. Name of Contractor.
e. Date(s) and time(s) video recording was recorded.
f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

1.3 QUALITY ASSURANCE

A. Photographer Qualifications: An individual who has been regularly engaged as a professional photographer of construction projects for not less than three years.

B. Construction Webcam Service Provider: A firm specializing in providing photographic equipment, web-based software, and related services for construction projects, with a record of providing satisfactory services similar to those required for Project.

1.4 FORMATS AND MEDIA

A. Digital Photographs: Provide color images in JPG format, produced by a digital camera with minimum sensor size of 12 megapixels, and at an image resolution of not less than 3200 by 2400 pixels**,** and with vibration-reduction technology. Use flash in low light levels or backlit conditions.

B. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 megapixels and capable of recording in full high-definition mode with vibration-reduction technology. Provide supplemental lighting in low light levels or backlit conditions.
C. Digital Images: Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

D. Metadata: Record accurate date and time and GPS location data from camera.
E. File Names: Name media files with date and project area and sequential numbering suffix.

1.5 CONSTRUCTION PHOTOGRAPHS

A. Photographer: Engage a qualified photographer to take construction photographs.
B. General: Take photographs with maximum depth of field and in focus.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.

C. Preconstruction Photographs: Before commencement of the Work, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.

1. Flag construction limits before taking construction photographs.
2. Take 20 photographs to show existing conditions adjacent to property before starting the Work.
3. Take 20 photographs of existing buildings either on or adjoining property, to accurately record physical conditions at start of construction.
4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

D. Concealed Work Photographs: Before proceeding with installing work that will conceal other work, take photographs sufficient in number, with annotated descriptions, to record nature and location of concealed Work, including, but not limited to, the following:

1. Underground utilities.
2. Underslab services.
3. Piping.
4. Electrical conduit.
5. Waterproofing and weather-resistant barriers.

E. Periodic Construction Photographs: Take photographs weekly coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

F. Final Completion Construction Photographs: Take photographs after date of Substantial Completion for submission as Project Record Documents. Architect will inform photographer of desired vantage points.

1.6 CONSTRUCTION VIDEO RECORDINGS

A. Video Recording Photographer: Engage a qualified videographer to record construction video recordings.

B. Narration: Describe scenes on video recording by audio narration by microphone while video recording is recorded. Include description of items being viewed, recent events, and planned activities. At each change in location, describe vantage point, location, direction (by compass point), and elevation or story of construction.

1. Confirm date and time at beginning and end of recording.
2. Begin each video recording with name of Project, Contractor's name, videographer's name, and Project location.

C. Transcript: Provide a typewritten transcript of the narration. Display images and running time captured from video recording opposite the corresponding narration segment.

D. Preconstruction Video Recording: Before starting excavation, demolition, and construction, record video recording of Project site and surrounding properties from different vantage points, as directed by Architect.

1. Flag construction limits before recording construction video recordings.
2. Show existing conditions adjacent to Project site before starting the Work.
3. Show existing buildings either on or adjoining Project site to accurately record physical conditions at the start of excavation, demolition, and construction.
4. Show protection efforts by Contractor.

E. Periodic Construction Video Recordings: Record video recording weekly coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last video recordings were recorded. Minimum recording time to be minutes(s).

PART 2 - PRODUCTS (NOT USED)
PART 3 - EXECUTION (NOT USED)

END OF SECTION 013233

SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Submittal schedule requirements.
2. Administrative and procedural requirements for submittals.

B. Related Requirements:

1. Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
2. Section 013100 "Project Management and Coordination" for submitting coordination drawings and subcontract list and for requirements for web-based Project software.
3. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
4. Section 013233 "Photographic Documentation" for submitting preconstruction photographs, periodic construction photographs, and Final Completion construction photographs.
5. Section 014000 "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
6. Section 017700 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
7. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
8. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
9. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

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

1.3 SUBMITTAL SCHEDULE

A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.

2. Initial Submittal Schedule: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal Schedule: Submit concurrently with the first complete submittal of Contractor's construction schedule.

    a. Submit revised submittal schedule as required to reflect changes in current status and timing for submittals.

4. Format: Arrange the following information in a tabular format:

    a. Scheduled date for first submittal.
    b. Specification Section number and title.
    c. Submittal Category: Action; informational.
    d. Name of subcontractor.
    e. Description of the Work covered.
    f. Scheduled date for Architect's final release or approval.
    g. Scheduled dates for purchasing.
    h. Scheduled date of fabrication.
    i. Scheduled dates for installation.
    j. Activity or event number.

1.4 SUBMITTAL FORMATS

A. Submittal Information: Include the following information in each submittal:

1. Project name.
2. Date.
3. Name of Architect.
4. Name of Construction Manager.
5. Name of Contractor.
6. Name of firm or entity that prepared submittal.
7. Names of subcontractor, manufacturer, and supplier.
8. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier and alphanumeric suffix for resubmittals.
9. Category and type of submittal.
10. Submittal purpose and description.
11. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
12. Drawing number and detail references, as appropriate.
13. Indication of full or partial submittal.
14. Location(s) where product is to be installed, as appropriate.
15. Other necessary identification.
16. Remarks.
17. Signature of transmitter.

B. Options: Identify options requiring selection by Architect.
C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

D. Paper Submittals:

1. Place a permanent label or title block on each submittal item for identification; include name of firm or entity that prepared submittal.
2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Action Submittals: Submit digital copy (PFD) of each submittal unless otherwise indicated. Architect will return two copies.
4. Informational Submittals: Submit two paper copies of each submittal unless otherwise indicated. Architect will not return copies.
5. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
6. Transmittal for Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using AIA Document G810 transmittal form.

E. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.

F. Submittals Utilizing Web-Based Project Software: Prepare submittals as PDF files or other format indicated by Project management software.

1.5 SUBMITTAL PROCEDURES

A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Email: Prepare submittals as PDF package and transmit to Architect by sending via email. Include PDF transmittal form. Include information in email subject line as requested by Architect.

    a. Architect will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.

2. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project management software website. Enter required data in web-based software site to fully identify submittal.
3. Paper: Prepare submittals in paper form and deliver to Architect.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.

4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections, so processing will not be delayed because of need to review submittals concurrently for coordination.

    a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized

because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 15 days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.

    a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.

D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

    1. Note date and content of previous submittal.
    2. Note date and content of revision in label or title block, and clearly indicate extent of revision.
    3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

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

1.6 SUBMITTAL REQUIREMENTS

A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

    1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.

2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.
    c. Standard color charts.
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.
    f. Application of testing agency labels and seals.
    g. Notation of coordination requirements.
    h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

    a. Wiring diagrams that show factory-installed wiring.
    b. Printed performance curves.
    c. Operational range diagrams.
    d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before Shop Drawings, and before or concurrently with Samples.

B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data unless submittal based on Architect's digital data drawing files is otherwise permitted.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

    a. Identification of products.
    b. Schedules.
    c. Compliance with specified standards.
    d. Notation of coordination requirements.
    e. Notation of dimensions established by field measurement.
    f. Relationship and attachment to adjoining construction clearly indicated.
    g. Seal and signature of professional engineer if specified.

2. Paper Sheet Size: Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm), but no larger than 30 by 42 inches (750 by 1067 mm).

    a. Two opaque (bond) copies of each submittal. Architect will return one copy.

b. Three opaque copies of each submittal. Architect will retain two copies; remainder will be returned.

C. Samples: Submit Samples for review of type, color, pattern, and texture for a check of these characteristics with other materials.

1. Transmit Samples that contain multiple, related components, such as accessories together in one submittal package.
2. Identification: Permanently attach label on unexposed side of Samples that includes the following:

    a. Project name and submittal number.
    b. Generic description of Sample.
    c. Product name and name of manufacturer.
    d. Sample source.
    e. Number and title of applicable Specification Section.
    f. Specification paragraph number and generic name of each item.

3. Email Transmittal: Provide PDF transmittal. Include digital image file illustrating Sample characteristics and identification information for record.
4. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.
5. Paper Transmittal: Include paper transmittal, including complete submittal information indicated.
6. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

    a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

7. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units, showing the full range of colors, textures, and patterns available.

    a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

8. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or

product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned.

1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.
4. Location within room or space.

E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.

G. Certificates:

1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.

2. Installer Certificates: Submit written statements on manufacturer's letterhead, certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead, certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
4. Material Certificates: Submit written statements on manufacturer's letterhead, certifying that material complies with requirements in the Contract Documents.
5. Product Certificates: Submit written statements on manufacturer's letterhead, certifying that product complies with requirements in the Contract Documents.
6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of AWS B2.1/B2.1M on AWS forms. Include names of firms and personnel certified.

H. Test and Research Reports:

1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for substrate preparation and primers required.
2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product

complies with building code in effect for Project. Include the following information:

a. Name of evaluation organization.
b. Date of evaluation.
c. Time period when report is in effect.
d. Product and manufacturers' names.
e. Description of product.
f. Test procedures and results.
g. Limitations of use.

1.7 DELEGATED DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file, paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

1.8 CONTRACTOR'S REVIEW

A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

1.9 ARCHITECT'S REVIEW

A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return.

1. PDF Submittals: Architect will indicate, via markup on each submittal, the appropriate action.

a. **Insert description of each action indicated on Architect's (and Construction Manager's) stamp**.

2. Paper Submittals: Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

3. Submittals by Web-Based Project Management Software: Architect will indicate, on Project management software website, the appropriate action.

a. Actions taken by indication on Project management software website have the following meanings:

1) Action indicated on Architect's (and Construction Manager's) stamp.

B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
E. Architect will discard submittals received from sources other than Contractor.

F. Submittals not required by the Contract Documents will be returned by Architect without action.

PART 2 - PRODUCTS (NOT USED)
PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 42 00
REFERENCES

PART 1 - GENERAL

1.1 DEFINITIONS

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

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
C. "Directed": A command or instruction by Architect. Other terms, including "requested," "authorized," "selected," "required," and "permitted," have the same meaning as "directed."
D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms, including "shown," "noted," "scheduled," and "specified," have the same meaning as "indicated."
E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
H. "Provide": Furnish and install, complete and ready for the intended use.

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

1.2 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract

Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

   1. For standards referenced by applicable building codes, comply with dates of standards as listed in building codes.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

   1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.3 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

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

   1. AABC - Associated Air Balance Council; www.aabc.com.
   2. AAMA - American Architectural Manufacturers Association; (see FGIA).
   3. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
   4. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
   5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
   6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
   7. ABMA - American Boiler Manufacturers Association; www.abma.com.
   8. ACI - American Concrete Institute; www.concrete.org.
   9. ACP - American Clean Power; (Formerly: American Wind Energy Association); www.cleanpower.org.

10. ACPA - American Concrete Pipe Association; www.concretepipe.org.
11. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
12. AF&PA - American Forest & Paper Association; www.afandpa.org.
13. AGA - American Gas Association; www.aga.org.
14. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
15. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
16. AI - Asphalt Institute; www.asphaltinstitute.org.
17. AIA - American Institute of Architects (The); www.aia.org.
18. AISC - American Institute of Steel Construction; www.aisc.org.
19. AISI - American Iron and Steel Institute; www.steel.org.
20. AITC - American Institute of Timber Construction; (see PLIB).
21. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
22. AMPP - Association for Materials Protection and Performance; www.ampp.org.
23. ANSI - American National Standards Institute; www.ansi.org.
24. AOSA/SCST - Association of Official Seed Analysts (The)/Society of Commercial Seed Technologists (The); www.analyzeseeds.com.
25. APA - APA - The Engineered Wood Association; www.apawood.org.
26. APA - Architectural Precast Association; www.archprecast.org.
27. API - American Petroleum Institute; www.api.org.
28. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
29. ASA - Acoustical Society of America; www.acousticalsociety.org.
30. ASCE - American Society of Civil Engineers; www.asce.org.
31. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (see ASCE).
32. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
33. ASME - ASME International; [**American Society of Mechanical Engineers (The)**]; www.asme.org.
34. ASSE - ASSE International; (American Society of Sanitary Engineering); www.asse-plumbing.org.
35. ASSP - American Society of Safety Professionals; www.assp.org.
36. ASTM - ASTM International; www.astm.org.
37. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
38. AVIXA - Audiovisual and Integrated Experience Association; www.avixa.org.
39. AWI - Architectural Woodwork Institute; www.awinet.org.
40. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
41. AWPA - American Wood Protection Association; www.awpa.com.
42. AWS - American Welding Society; www.aws.org.
43. AWWA - American Water Works Association; www.awwa.org.

44. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
45. BIA - Brick Industry Association (The); www.gobrick.com.
46. BICSI - BICSI, Inc.; www.bicsi.org.
47. BIFMA - Business and Institutional Furniture Manufacturer's Association; www.bifma.org.
48. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
49. BWF - Badminton World Federation; www.bwfbadminton.com.
50. CARB - California Air Resources Board; www.arb.ca.gov.
51. CDA - Copper Development Association Inc.; www.copper.org.
52. CE - Conformite Europeenne (European Commission); www.ec.europa.eu/growth/single-market/ce-marking.
53. CEA - Canadian Electricity Association; www.electricity.ca.
54. CFFA - Chemical Fabrics and Film Association, Inc.; www.chemicalfabricsandfilm.com.
55. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
56. CGA - Compressed Gas Association; www.cganet.com.
57. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
58. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
59. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
60. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
61. CPA - Composite Panel Association; www.compositepanel.org.
62. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
63. CRRC - Cool Roof Rating Council; www.coolroofs.org.
64. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
65. CSA - CSA Group; www.csagroup.org.
66. CSI - Cast Stone Institute; www.caststone.org.
67. CSI - Construction Specifications Institute (The); www.csiresources.org.
68. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
69. CTA - Consumer Technology Association; www.cta.tech.
70. CTI - Cooling Technology Institute; www.coolingtechnology.org.
71. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
72. DHA - Decorative Hardwoods Association; www.decorativehardwoods.org.
73. DHI - Door and Hardware Institute; www.dhi.org.
74. ECIA - Electronic Components Industry Association; www.ecianow.org.
75. EIMA - EIFS Industry Members Association; www.eima.com.
76. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
77. EOS/ESD - EOS/ESD Association, Inc.; Electrostatic Discharge Association; www.esda.org.
78. ESTA - Entertainment Services and Technology Association; www.esta.org.
79. EVO - Efficiency Valuation Organization; www.evo-world.org.

80. FCI - Fluid Controls Institute; www.fluidcontrolsinstitute.org.
81. FGIA - Fenestration and Glazing Industry Alliance; https://fgiaonline.org.
82. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
83. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
84. FM Approvals - FM Approvals LLC; www.fmapprovals.com.
85. FM Global - FM Global; www.fmglobal.com.
86. FRSA - Florida Roofing and Sheet Metal Contractors Association, Inc.; www.floridaroof.com.
87. FSA - Fluid Sealing Association; www.fluidsealing.com.
88. FSC - Forest Stewardship Council U.S.; www.fscus.org.
89. GA - Gypsum Association; www.gypsum.org.
90. GS - Green Seal; www.greenseal.org.
91. HI - Hydraulic Institute; www.pumps.org.
92. HMMA - Hollow Metal Manufacturers Association; (see NAAMM).
93. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
94. IAS - International Accreditation Service; www.iasonline.org.
95. ICC - International Code Council; www.iccsafe.org.
96. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
97. ICPA - International Cast Polymer Association (The); www.theicpa.com.
98. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
99. IEC - International Electrotechnical Commission; www.iec.ch.
100. IEEE SA - IEEE Standards Association; https://standards.ieee.org.
101. IES - Illuminating Engineering Society; www.ies.org.
102. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
103. IGMA - Insulating Glass Manufacturers Alliance; (see FGIA).
104. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.org.
105. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
106. Intertek - Intertek Group; www.intertek.com.
107. ISA - International Society of Automation (The); www.isa.org.
108. ISFA - International Surface Fabricators Association; www.isfanow.org.
109. ISO - International Organization for Standardization; www.iso.org.
110. ITU - International Telecommunication Union; www.itu.int.
111. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
112. LPI - Lightning Protection Institute; www.lightning.org.
113. MBMA - Metal Building Manufacturers Association; www.mbma.com.
114. MCA - Metal Construction Association; www.metalconstruction.org.
115. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
116. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
117. MHI - Material Handling Industry; www.mhi.org.

118. MMPA - Moulding & Millwork Producers Association; www.wmmpa.com.
119. MPI - Master Painters Institute; www.paintinfo.com.
120. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry, Inc.; www.msshq.org.
121. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
122. NACE - NACE International; (National Association of Corrosion Engineers International); (see AMPP).
123. NADCA - National Air Duct Cleaners Association; www.nadca.com.
124. NAIMA - North American Insulation Manufacturers Association; www.insulationinstitute.org.
125. NALP - National Association of Landscape Professionals; www.landscapeprofessionals.org.
126. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
127. NBI - New Buildings Institute; www.newbuildings.org.
128. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
129. NCMA - National Concrete Masonry Association; www.ncma.org.
130. NEBB - National Environmental Balancing Bureau; www.nebb.org.
131. NECA - National Electrical Contractors Association; www.necanet.org.
132. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
133. NEMA - National Electrical Manufacturers Association; www.nema.org.
134. NETA - InterNational Electrical Testing Association; www.netaworld.org.
135. NFHS - National Federation of State High School Associations; www.nfhs.org.
136. NFPA - National Fire Protection Association; www.nfpa.org.
137. NFPA - NFPA International; (see NFPA).
138. NFRC - National Fenestration Rating Council; www.nfrc.org.
139. NGA - National Glass Association; www.glass.org.
140. NHLA - National Hardwood Lumber Association; www.nhla.com.
141. NLGA - National Lumber Grades Authority; www.nlga.org.
142. NOFMA - National Oak Flooring Manufacturers Association; (see NWFA).
143. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
144. NRCA - National Roofing Contractors Association; www.nrca.net.
145. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
146. NSF - NSF International; www.nsf.org.
147. NSI - Natural Stone Institute; www.naturalstoneinstitute.org.
148. NSPE - National Society of Professional Engineers; www.nspe.org.
149. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.

150. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
151. NWFA - National Wood Flooring Association; www.nwfa.org.
152. NWRA - National Waste & Recycling Association; www.wasterecycling.org.
153. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
154. PDI - Plumbing & Drainage Institute; www.pdionline.org.
155. PLASA - PLASA; www.plasa.org.
156. PLIB - Pacific Lumber Inspection Bureau; www.plib.org.
157. PVCPA - Uni-Bell PVC Pipe Association; www.uni-bell.org.
158. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
159. RFCI - Resilient Floor Covering Institute; www.rfci.com.
160. RIS - Redwood Inspection Service; (see WWPA).
161. SAE - SAE International; www.sae.org.
162. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
163. SDI - Steel Deck Institute; www.sdi.org.
164. SDI - Steel Door Institute; www.steeldoor.org.
165. SEFA - Scientific Equipment and Furniture Association (The); www.sefalabs.com.
166. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (see ASCE).
167. SIA - Security Industry Association; www.securityindustry.org.
168. SJI - Steel Joist Institute; www.steeljoist.org.
169. SMA - Screen Manufacturers Association; www.smainfo.org.
170. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
171. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
172. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
173. SPIB - Southern Pine Inspection Bureau; www.spib.org.
174. SPRI - Single Ply Roofing Industry; www.spri.org.
175. SRCC - Solar Rating & Certification Corporation; www.solar-rating.org.
176. SSINA - Specialty Steel Industry of North America; www.ssina.com.
177. SSPC - SSPC: The Society for Protective Coatings; (see AMPP).
178. STI/SPFA - Steel Tank Institute/Steel Plate Fabricators Association; www.steeltank.com.
179. SWI - Steel Window Institute; www.steelwindows.com.
180. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
181. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
182. TCNA - Tile Council of North America, Inc.; www.tcnatile.com.
183. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.kbcdco.tema.org.
184. TIA - Telecommunications Industry Association (The); www.tiaonline.org.

185. TMS - The Masonry Society; www.masonrysociety.org.
186. TPI - Truss Plate Institute; www.tpinst.org.
187. TPI - Turfgrass Producers International; www.turfgrasssod.org.
188. TRI - Tile Roofing Industry Alliance; www.tileroofing.org.
189. ULSE - UL Standards & Engagement Inc.; www.ulse.org.
190. UL - UL Solutions Inc.; www.ul.com.
191. USAV - USA Volleyball; www.usavolleyball.org.
192. USGBC - U.S. Green Building Council; www.usgbc.org.
193. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
194. WA - Wallcoverings Association; www.wallcoverings.org.
195. WCLIB - West Coast Lumber Inspection Bureau; (see PLIB).
196. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
197. WDMA - Window & Door Manufacturers Association; www.wdma.com.
198. WI - Woodwork Institute; www.woodworkinstitute.com.
199. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
200. WWPA - Western Wood Products Association; www.wwpa.org.

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.

1. DIN - Deutsches Institut fur Normung e.V.; www.din.de.
2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
3. ICC - International Code Council; www.iccsafe.org.
4. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.

1. CPSC - U.S. Consumer Product Safety Commission; www.cpsc.gov.
2. DOC - U.S. Department of Commerce; www.commerce.gov.
3. DOD - U.S. Department of Defense; www.defense.gov.
4. DOE - U.S. Department of Energy; www.energy.gov.
5. DOJ - U.S. Department of Justice; www.ojp.usdoj.gov
6. DOS - U.S. Department of State; www.state.gov.
7. EPA - United States Environmental Protection Agency; www.epa.gov.
8. FAA - Federal Aviation Administration; www.faa.gov.
9. GPO - U.S. Government Publishing Office; www.gpo.gov.
10. GSA - U.S. General Services Administration; www.gsa.gov.

11. HUD - U.S. Department of Housing and Urban Development; www.hud.gov.
12. LBNL - Lawrence Berkeley National Laboratory; Energy Technologies Area; www.lbl.gov/.
13. NIST - National Institute of Standards and Technology; www.nist.gov.
14. OSHA - Occupational Safety & Health Administration; www.osha.gov.
15. TRB - Transportation Research Board; National Cooperative Highway Research Program; The National Academies; www.trb.org.
16. USACE - U.S. Army Corps of Engineers; www.usace.army.mil.
17. USDA - U.S. Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
18. USDA - U.S. Department of Agriculture; Rural Utilities Service; www.usda.gov.
19. USP - U.S. Pharmacopeial Convention; www.usp.org.
20. USPS - United States Postal Service; www.usps.com.

E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CFR - Code of Federal Regulations; Available from U.S. Government Publishing Office; www.govinfo.gov.
2. DOD - U.S. Department of Defense; Military Specifications and Standards; Available from DLA Document Services; www.dsp.dla.mil/Specs-Standards/.
3. DSCC - Defense Supply Center Columbus; (see FS).
4. FED-STD - Federal Standard; (see FS).
5. FS - Federal Specification; Available from DLA Document Services; www.dsp.dla.mil/Specs-Standards/.

    a. Available from Defense Standardization Program; www.dsp.dla.mil.
    b. Available from U.S. General Services Administration; www.gsa.gov.
    c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org.

6. MILSPEC - Military Specifications and Standards; (see DOD).
7. USAB - United States Access Board; www.access-board.gov.
8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (see USAB).

F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. BEARHFTI; California Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation; (see BHGS).
2. BHGS; State of California Bureau of Household Goods and Services; (Formerly: California Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation); www.bhgs.dca.ca.gov.
3. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.oal.ca.gov/publications/ccr/.
4. CDPH; California Department of Public Health; Indoor Air Quality Program; www.cdph.ca.gov/Programs/CCDPHP/DEODC/EHLB/IAQ/Pages/Main-Page.aspx.
5. CPUC; California Public Utilities Commission; www.cpuc.ca.gov.
6. SCAQMD; South Coast Air Quality Management District; www.aqmd.gov.
7. TFS; Texas A&M Forest Service; Sustainable Forestry and Economic Development; https://tfsweb.tamu.edu/.

PART 2 - PRODUCTS (NOT USED)
PART 3 - EXECUTION (NOT USED)

END OF SECTION 014200

SECTION 01 50 00
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.
2. Section 011200 "Multiple Contract Summary" for responsibilities for temporary facilities and controls for projects utilizing multiple contracts.
3. Section 012100 "Allowances" for allowance for metered use of temporary utilities.

1.2 USE CHARGES

A. Installation, removal, and use charges for temporary facilities to 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. Sewer Service: **Pay** sewer-service use charges for sewer usage by all entities for construction operations.
C. Water Service: **Pay** water-service use charges for water used by all entities for construction operations.
D. Electric Power Service: **Pay** electric-power-service use charges for electricity used by all entities for construction operations.

E. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use **with metering**. Provide connections and extensions of services **and metering** as required for construction operations.
F. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use **with metering**. Provide connections and extensions of services **and metering** as required for construction operations.

G. Sewer, Water, and Electric Power Service: Use charges are specified in Section 011200 "Multiple Contract Summary."

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. Implementation and Termination Schedule: Within **15** days of date established for commencement of the Work, submit schedule indicating implementation and termination dates of each temporary utility.
C. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.
D. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

E. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold. Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.

    1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and requirements for replacing water-damaged Work.
    2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
    3. Indicate methods to be used to avoid trapping water in finished work.

F. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Include the following:

    1. Locations of dust-control partitions at each phase of work.
    2. HVAC system isolation schematic drawing.
    3. Location of proposed air-filtration system discharge.
    4. Waste-handling procedures.
    5. Other dust-control measures.

G. Noise and Vibration Control Plan: Identify construction activities that may impact the occupancy and use of existing spaces within the building or adjacent existing buildings, whether occupied by others, or occupied by Owner. Include the following:

1. Methods used to meet the goals and requirements of Owner.
2. Concrete cutting method(s) to be used.
3. Location of construction devices on the site.
4. Show compliance with the use and maintenance of quieted construction devices for the duration of the Project.
5. Indicate activities that may disturb building occupants and that are planned to be performed during non-standard working hours as coordinated with Owner.
6. Indicate locations of sensitive **equipment** areas or other areas requiring special attention as identified by Owner. Indicate means for complying with Owner's requirements.

1.4 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. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

C. Accessible Temporary Egress: Comply with applicable provisions in t**he DOJ's "2010 ADA Standards for Accessible Design" and** .

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 MATERIALS

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

5/8-inch-OD top and bottom rails. Provide c**oncrete** or **galvanized-steel** bases for supporting posts.

C. Fencing Windscreen Privacy Screen: Polyester fabric scrim with grommets for attachment to chain-link fence, sized to height of fence, in color selected by Architect from manufacturer's standard colors.
D. Wood Enclosure Fence: Plywood, **8 feet** high, framed with four 2-by-4-inch rails, with preservative-treated wood posts spaced not more than 8 feet apart.

E. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less in accordance with ASTM E84 and passing NFPA 701 Test Method 2.

F. Dust-Control Adhesive-Surface Walk-Off Mats: Provide mats, minimum 36 by 60 inches.

G. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.2 TEMPORARY FACILITIES

A. Field Offices:

1. Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:

1. Furniture required for Project-site documents, including file cabinets, plan tables, plan racks, and bookcases.
2. Conference room of sufficient size to accommodate meetings of **10** individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot-square tack and marker boards.
3. Drinking water and private toilet.

4. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
5. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.

C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Store combustible materials apart from building.

2.3 EQUIPMENT

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

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating, Cooling, and Dehumidifying Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.

3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of **8** at each return-air grille in system and remove at end of construction.

C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

3.2 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

   1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary."

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

C. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.

   1. Prior to commencing work, isolate the HVAC system in area where work is to be performed **in accordance with coordination drawings**.

      a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
      b. Maintain negative air pressure within work area, using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.

   2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
   3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

3.3 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

   1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

   1. Connect temporary sewers as directed by authorities having jurisdiction.

C. Water Service:

1. Install water service and distribution piping in sizes and pressures adequate for construction.
2. Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

1. Use of Permanent Toilets: Use of Owner's existing or new toilet facilities **will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use**

E. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.

F. Electric Power Service:

1. Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.
2. Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

a. Install electric power service **overhead** unless otherwise indicated.

b. Connect temporary service to Owner's existing power source, as directed by Owner.

G. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

H. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install **WiFi cell phone access equipment and one** land-based telephone line(s) for each field office.

1. At each telephone, post a list of important telephone numbers.

    a. Police and fire departments.
    b. Ambulance service.
    c. Contractor's home office.
    d. Contractor's emergency after-hours telephone number.
    e. Architect's office.
    f. Engineers' offices.
    g. Owner's office.
    h. Principal subcontractors' field and home offices.

3.4 SUPPORT FACILITIES INSTALLATION

A. Comply with the following:

    1. Provide construction for temporary field offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible in accordance with 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. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas **within construction limits indicated** on Drawings.

    1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. Temporary Use of Planned Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

    1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
    2. Prepare subgrade and install subbase and base for temporary roads and paved areas in accordance with Section 312000 "Earth Moving."

    3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.

4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course in accordance with Section 321216 "Asphalt Paving."

D. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain, including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

E. Parking:**Use designated areas of Owner's existing** parking areas for construction personnel.
F. Storage and Staging:**Use designated areas of Project site** for storage and staging needs.

G. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

H. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

1. Identification Signs: Provide Project identification signs as indicated on Drawings.
2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.

    a. Provide temporary, directional signs for construction personnel and visitors.

3. Maintain and touch up signs, so they are legible at all times.

I. Waste Disposal Facilities:

1. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
2. 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."

J. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

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

K. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.

L. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.

1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas, so no evidence remains of correction work.

M. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

1. Comply with work restrictions specified in Section 011000 "Summary."

C. Temporary Erosion and Sedimentation Control:

1. Comply with **requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.**

2. 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, in accordance with **requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent**.

    a. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant-protection zones.
    b. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
    c. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
    d. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
E. Tree and Plant Protection:

1. Comply with requirements specified in Section 015639 "Temporary Tree and Plant Protection."
2. Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

F. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals, so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using materials approved by authorities having jurisdiction.

G. Site Enclosure Fence: **Before construction operations begin**, furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.

1. Extent of Fence: **As required to enclose entire Project site or portion determined sufficient to accommodate construction operations**
2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. **Furnish one set of keys to Owner.**

H. 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.

I. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

J. 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.

K. Covered Walkway: Erect protective, covered walkway for passage of individuals through or adjacent to Project site. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction.

1. Provide overhead decking, protective enclosure walls, handrails, barricades, warning signs, exit signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.
2. Paint and maintain appearance of walkway for duration of the Work.

L. 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.

M. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.

1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition in accordance with requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign, stating that hoses are for fire-protection purposes only

and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.6 MOISTURE AND MOLD CONTROL

A. Moisture and Mold Protection: Protect stored materials and installed Work in accordance with Moisture and Mold Protection Plan.
B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

1. Protect porous materials from water damage.
2. Protect stored and installed material from flowing or standing water.
3. Keep porous and organic materials from coming into prolonged contact with concrete.
4. Remove standing water from decks.
5. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard and replace stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.

D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for **48** hours are considered defective and require replacing.
b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for **48** hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
c. Remove and replace materials that cannot be completely restored to their manufactured moisture level within **48** hours.

3.7 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.

2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

SECTION 01 57 23
TEMPORARY STORM WATER POLLUTION CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Temporary stormwater pollution controls.

1.3 STORMWATER POLLUTION PREVENTION PLAN

A. The Stormwater Pollution Prevention Plan (SWPPP) is part of the Contract Documents and is bound into this Project Manual.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at **Project site**.

1. Meet with Owner, Architect and earthwork subcontractor.
2. Review requirements of the SWPPP, including permitting process, worker training, and inspection and maintenance requirements.

1.5 INFORMATIONAL SUBMITTALS

A. Stormwater Pollution Prevention Plan (SWPP): Within **15** days of date established for commencement of the Work, submit completed SWPPP.
B. EPA authorization under the EPA's "2017 Construction General Permit (CGP)."
C. Stormwater Pollution Prevention (SWPP) Training Log: For each individual performing Work under the SWPPP.
D. Inspection reports.

1.6 QUALITY ASSURANCE

A. Stormwater Pollution Prevention Plan (SWPPP) Coordinator: Experienced individual or firm with a record of successful water pollution control management coordination of projects with similar requirements.

   1. SWPPP Coordinator shall complete and finalize the SWPPP form.
   2. SWPPP Coordinator shall be responsible for inspections and maintaining of all requirements of the SWPPP.

B. Installers: Trained as indicated in the SWPPP.

PART 2 - PRODUCTS

2.1 TEMPORARY STORMWATER POLLUTION CONTROLS

A. Provide temporary stormwater pollution controls as required by the SWPPP.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with all best management practices, general requirements, performance requirements, reporting requirements, and all other requirements included in the SWPPP.
B. Locate stormwater pollution controls in accordance with the SWPPP.
C. Conduct construction as required to comply with the SWPPP and that minimize possible contamination or pollution or other undesirable effects.

   1. Inspect, repair, and maintain SWPPP controls during construction.

      a. Inspect all SWPPP controls not less than every seven days, and after each occurrence of a storm event, as outlined in the SWPPP.

D. Remove SWPPP controls at completion of construction and restore and stabilize areas disturbed during construction.

END OF SECTION 015723

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. The Work of This Section Includes: Administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
B. Related Requirements:

1. Section 011000 "Summary" for Contractor requirements related to Owner-furnished products.
2. Section 012100 "Allowances" for products selected under an allowance.
3. Section 012300 "Alternates" for products selected under an alternate.
4. Section 012500 "Substitution Procedures" for requests for substitutions.
5. Section 014200 "References" for applicable industry standards for products specified.
6. Section 017700 "Closeout Procedures" for submitting warranties.

1.2 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycled content materials are considered new products unless otherwise indicated.
3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in "Comparable Products" Article, to have the indicated qualities related to type, function, dimension, in-service performance,

physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.

   1. Evaluating Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification. Manufacturer's published attributes and characteristics of basis-of-design product also establish salient characteristics of products for purposes of evaluating comparable products.

C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.
D. Comparable Product Request Submittal: An action submittal requesting consideration of a comparable product, including the following information:

   1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.
   2. Data indicating compliance with the requirements specified in "Comparable Products" Article.

E. Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 013300 "Submittal Procedures."
F. Substitution: Refer to Section 012500 "Substitution Procedures" for definition and limitations on substitutions.

1.3 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with

products previously selected, even if previously selected products were also options.

1. Resolution of Compatibility Disputes between Multiple Contractors:

    a. Contractors are responsible for providing products and construction methods compatible with products and construction methods of other contractors.
    b. If a dispute arises between the multiple contractors over concurrently selectable but incompatible products, Architect will determine which products will be used.

B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is inconspicuous.
2. Equipment Nameplates: Provide a permanent nameplate on each item of service- or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:

    a. Name of product and manufacturer.
    b. Model and serial number.
    c. Capacity.
    d. Speed.
    e. Ratings.

3. See individual identification Sections in Divisions 21, 22, 23, and 26 for additional equipment identification requirements.

1.4 COORDINATION

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

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products, using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and that products are undamaged and properly protected.

C. Storage:

1. Provide a secure location and enclosure at Project site for storage of materials and equipment.
2. Store products to allow for inspection and measurement of quantity or counting of units.
3. Store materials in a manner that will not endanger Project structure.
4. Store products that are subject to damage by the elements under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation and with adequate protection from wind.
5. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.

8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.6 PRODUCT WARRANTIES

A. Warranties specified in other Sections are to be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written standard warranty form furnished by individual manufacturer for a particular product and issued in the name of Owner or endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner and issued in the name of Owner or endorsed by manufacturer to Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included in the Project Manual, prepare a written document, using indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in Specifications establish salient characteristics of products.

6. Or Equal: For products specified by name and accompanied by the term "or equal," "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

    a. Submit additional documentation required by Architect in order to establish equivalency of proposed products. Unless otherwise indicated, evaluation of "or equal" product status is by Architect, whose determination is final.

B. Product Selection Procedures:

1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

    a. Sole product may be indicated by the phrase "Subject to compliance with requirements, provide the following."

2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

    a. Sole manufacturer/source may be indicated by the phrase "Subject to compliance with requirements, provide products by the following."

3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered.

    a. Limited list of products may be indicated by the phrase "Subject to compliance with requirements, provide one of the following."

4. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed or an unnamed product that complies with requirements.

    a. Non-limited list of products is indicated by the phrase "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following."
    b. Provision of an unnamed product is not considered a substitution, if the product complies with requirements.

5. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered.

    a. Limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, provide products by one of the following."

6. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed or a product by an unnamed manufacturer that complies with requirements.

a. Non-limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following."
b. Provision of products of an unnamed manufacturer is not considered a substitution, if the product complies with requirements.

7. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications may additionally indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

    a. For approval of products by unnamed manufacturers, comply with requirements in Section 012500 "Substitution Procedures" for substitutions for convenience.

C. Visual Matching Specification: Where Specifications require the phrase "match Architect's sample," provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

    1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or a similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.
E. Sustainable Product Selection: Where Specifications require product to meet sustainable product characteristics, select products complying with indicated requirements. Comply with requirements in Division 01 sustainability requirements Section and individual Specification Sections.

    1. Select products for which sustainable design documentation submittals are available from manufacturer.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions

are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with the following requirements:

1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those of the named basis-of-design product. Significant product qualities include attributes such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects, with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

B. Architect's Action on Comparable Products Submittal: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for a comparable product. Architect will notify Contractor of approval or rejection of proposed comparable product within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

   1. Architect's Approval of Submittal: Marked with approval notation from Architect's action stamp or Indication of approval in web-based Project management software. See Section 013300 "Submittal Procedures."
   2. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

C. Submittal Requirements, Two-Step Process: Approval by Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.
D. Submittal Requirements, Single-Step Process: When acceptable to Architect, incorporate specified submittal requirements of individual Specification Section in combined submittal for comparable products. Approval by Architect of Contractor's request for use of comparable product and of individual submittal requirements will also satisfy other submittal requirements.

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 74 19
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Salvaging nonhazardous demolition and construction waste.
2. Recycling nonhazardous demolition and construction waste.
3. Disposing of nonhazardous demolition and construction waste.

B. Related Requirements:

1. Section 011200 "Multiple Contract Summary" for coordination of responsibilities for waste management.
2. Section 042000 "Unit Masonry" for disposal requirements for masonry waste.
3. Section 044313.13 "Anchored Stone Masonry Veneer" for disposal requirements for excess stone and stone waste.
4. Section 044313.16 "Adhered Stone Masonry Veneer" for disposal requirements for excess stone and stone waste.
5. Section 311000 "Site Clearing" for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

1.3 DEFINITIONS

A. Construction Waste: Building, structure, and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
B. Demolition Waste: Building, structure, and site improvement materials resulting from demolition operations.

C. Disposal: Removal of demolition or construction waste and subsequent salvage, sale, recycling, or deposit in landfill, incinerator acceptable to authorities having jurisdiction, or designated spoil areas on Owner's property.
D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition and construction waste becomes property of Contractor.
B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

    1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 ACTION SUBMITTALS

A. Waste Management Plan: Submit plan within 30 days of date established for commencement of the Work.

1.6 INFORMATIONAL SUBMITTALS

A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Use Form CWM-7 for construction waste. Include the following information:

    1. Material category.
    2. Generation point of waste.
    3. Total quantity of waste in tons (tonnes).
    4. Quantity of waste salvaged, both estimated and actual in tons (tonnes).
    5. Quantity of waste recycled, both estimated and actual in tons (tonnes).
    6. Total quantity of waste recovered (salvaged plus recycled) in tons (tonnes).

7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

G. Qualification Data: For waste management coordinator.

1.7 QUALITY ASSURANCE

A. Waste Management Coordinator Qualifications: Experienced firm, or individual employed and assigned by General Contractor, with a record of successful waste management coordination of projects with similar requirements. Superintendent may serve as Waste Management Coordinator.
B. Regulatory Requirements: Comply with transportation and disposal regulations of authorities having jurisdiction.

1.8 WASTE MANAGEMENT PLAN

A. General: Develop a waste management plan according to requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
B. Waste Identification: Indicate anticipated types and quantities of demolition, site-clearing, and construction waste generated by the Work. Use Form CWM-1 for construction waste and Form CWM-2 for demolition waste. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Use Form CWM-3 for construction waste and Form CWM-4 for demolition waste. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.

D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there were no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Use Form CWM-5 for construction waste and Form CWM-6 for demolition waste. Include the following:

1. Total quantity of waste.
2. Estimated cost of disposal (cost per unit). Include transportation and tipping fees and cost of collection containers and handling for each type of waste.
3. Total cost of disposal (with no waste management).
4. Revenue from salvaged materials.
5. Revenue from recycled materials.
6. Savings in transportation and tipping fees by donating materials.
7. Savings in transportation and tipping fees that are avoided.
8. Handling and transportation costs. Include cost of collection containers for each type of waste.
9. Net additional cost or net savings from waste management plan.

PART 2 - PRODUCTS

2.1 RECYCLING RECEIVERS AND PROCESSORS

A. Subject to compliance with requirements, available recycling receivers and processors include, but are not limited to, the following:

2.2 PERFORMANCE REQUIREMENTS

A. General: Achieve end-of-Project rates for salvage/recycling of 50 percent by weight of total nonhazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials, including the following:

1. Demolition Waste:

a. Asphalt paving.
b. Concrete.
c. Concrete reinforcing steel.
d. Brick.
e. Concrete masonry units.
f. Wood studs.
g. Wood joists.
h. Plywood and oriented strand board.
i. Wood paneling.
j. Wood trim.
k. Structural and miscellaneous steel.
l. Rough hardware.
m. Roofing.
n. Insulation.
o. Doors and frames.
p. Door hardware.
q. Windows.
r. Glazing.
s. Metal studs.
t. Gypsum board.
u. Acoustical tile and panels.
v. Carpet.
w. Carpet pad.
x. Demountable partitions.
y. Equipment.
z. Cabinets.
aa. Plumbing fixtures.

bb. Piping.
cc. Supports and hangers.
dd. Valves.
ee. Sprinklers.
ff. Mechanical equipment.
gg. Refrigerants.
hh. Electrical conduit.
ii. Copper wiring.
jj. Lighting fixtures.
kk. Lamps.
ll. Ballasts.
mm. Electrical devices.
nn. Switchgear and panelboards.
oo. Transformers.

2. Construction Waste:

a. Masonry and CMU.
b. Lumber.
c. Wood sheet materials.
d. Wood trim.
e. Metals.
f. Roofing.
g. Insulation.
h. Carpet and pad.
i. Gypsum board.
j. Piping.
k. Electrical conduit.
l. Packaging: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following uncontaminated packaging materials:

1) Paper.
2) Cardboard.
3) Boxes.
4) Plastic sheet and film.
5) Polystyrene packaging.
6) Wood crates.
7) Wood pallets.
8) Plastic pails.

m. Construction Office Waste: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following construction office waste materials:

1) Paper.
2) Aluminum cans.

3) Glass containers.

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

1. Comply with operation, termination, and removal requirements in Section 015000 "Temporary Facilities and Controls."

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.
C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.

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

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

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged and recycled.
2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 RECYCLING WASTE, GENERAL

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

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall be shared equally by Owner and Contractor.
C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free

of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.

D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.

    1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

        a. Inspect containers and bins for contamination and remove contaminated materials if found.

    2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
    3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
    4. Store components off the ground and protect from the weather.
    5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor as often as required to prevent overfilling bins.

3.3 RECYCLING DEMOLITION WASTE

A. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
B. Metals: Separate metals by type.

    1. Structural Steel: Stack members according to size, type of member, and length.
    2. Remove and dispose of bolts, nuts, washers, and other rough hardware.

C. Metal Suspension System: Separate metal members, including trim and other metals from acoustical panels and tile, and sort with other metals.
D. Carpet Tile: Remove debris, trash, and adhesive.

    1. Stack tile on pallet and store clean, dry carpet in a closed container or trailer provided by carpet reclamation agency or carpet recycler.

E. Piping: Reduce piping to straight lengths and store by material and size. Separate supports, hangers, valves, sprinklers, and other components by material and size.

F. Conduit: Reduce conduit to straight lengths and store by material and size.
G. Lamps: Separate lamps by type and store according to requirements in 40 CFR 273.

3.4 RECYCLING CONSTRUCTION WASTE

A. Packaging:

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

B. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

    a. Comply with requirements in Section 329300 "Plants" for use of clean sawdust as organic mulch.

C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.

1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

    a. Comply with requirements in Section 329300 "Plants" for use of clean ground gypsum board as inorganic soil amendment.

D. Paint: Seal containers and store by type.

3.5 DISPOSAL OF WASTE

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

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.

2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. General: Except for items or materials to be salvaged or recycled, remove waste materials and legally dispose of at designated spoil areas on Owner’s property.

C. Burning: Do not burn waste materials.
D. Burning: Burning of waste materials is permitted only at designated areas on Owner's property, provided required permits are obtained. Provide full-time monitoring for burning materials until fires are extinguished.

3.6 ATTACHMENTS

A. Form CWM-1 for construction waste identification.
B. Form CWM-2 for demolition waste identification.
C. Form CWM-3 for construction waste reduction work plan.
D. Form CWM-4 for demolition waste reduction work plan.
E. Form CWM-5 for cost/revenue analysis of construction waste reduction work plan.
F. Form CWM-6 for cost/revenue analysis of demolition waste reduction work plan.
G. Form CWM-7 for construction waste reduction progress report.
H. Form CWM-8 for demolition waste reduction progress report.

END OF SECTION 017419

SECTION 01 77 00
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. List of incomplete items.
4. Submittal of Project warranties.
5. Final cleaning.

B. Related Requirements:

1. Section 012900 "Payment Procedures" for requirements for Applications for Payment for Substantial Completion and Final Completion.
2. Section 013233 "Photographic Documentation" for submitting Final Completion construction photographic documentation.
3. Section 017823 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.
4. Section 017839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
5. Section 017900 "Demonstration and Training" for requirements to train Owner's maintenance personnel to adjust, operate, and maintain products, equipment, and systems.

1.2 DEFINITIONS

A. List of Incomplete Items: Contractor-prepared list of items to be completed or corrected, prepared for the Architect's use prior to Architect's inspection, to determine if the Work is substantially complete.

1.3 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.

1.4 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.
B. Certificate of Insurance: For continuing coverage.
C. Field Report: For pest-control inspection.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items required by other Sections.

1.6 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"), indicating the value of each item on the list and reasons why the Work is incomplete.
B. Submittals Prior to 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, damage or settlement surveys, property surveys, 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 Architect. Label with manufacturer's name and model number.

        a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Architect's or Owner's signature for receipt of submittals.

    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 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, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

1.7 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 will 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.
4. Submit pest-control final inspection report.
5. Submit Final Completion photographic documentation.

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. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.8 LIST OF INCOMPLETE ITEMS

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor, listed by room or space number.
2. Organize items applying to each space by major element, including categories for ceilings, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:

a. Project name.
b. Date.
c. Name of Architect.
d. Name of Contractor.

e. Page number.

4. Submit list of incomplete items in the following format:

a. MS Excel Electronic File: Architect will return annotated file.
b. PDF Electronic File: Architect will return annotated file.
c. Web-Based Project Software Upload: Utilize software feature for creating and updating list of incomplete items (punch list).
d. Three Paper Copies: Architect will return two copies.

1.9 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. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

D. 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.

1. Submit on digital media acceptable to Architect.

E. 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.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

F. 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.

1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: 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. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Rake grounds that are not planted, mulched, or paved to a smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Remove snow and ice to provide safe access to building.
f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

g. Remove debris and surface dust from limited-access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
h. Clean flooring, removing debris, dirt, and staining; clean in accordance with manufacturer's instructions.
i. Vacuum and mop concrete.
j. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean in accordance with manufacturer's instructions if visible soil or stains remain.
k. 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.
l. Remove labels that are not permanent.
m. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
p. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.

    1) Clean HVAC system in compliance with NADCA ACR. Section 230130.52 "Existing HVAC Air-Distribution System Cleaning." Provide written report on completion of cleaning.

q. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
r. Clean strainers.
s. Leave Project clean and ready for occupancy.

C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.
D. Construction Waste Disposal: Comply with waste-disposal requirements in Section 015000 "Temporary Facilities and Controls" or Section 017419 "Construction Waste Management and Disposal."

3.2 CORRECTION OF THE WORK

A. Complete repair and restoration operations required by "Correction of the Work" Article in Section 017300 "Execution" before requesting inspection for determination of Substantial Completion.

END OF SECTION 017700

SECTION 01 78 23
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.

B. Related Requirements:

1. Section 011200 "Multiple Contract Summary" for coordinating operation and maintenance manuals covering the Work of multiple contracts.
2. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
3. Section 019113 "General Commissioning Requirements" for verification and compilation of data into operation and maintenance manuals.
4. Section 260010 "Supplemental Requirements for Electrical" for requirements for Electrical Preventative Maintenance (EPM) Program binders that form part of the operation and maintenance data of this Section and include additional requirements for operation, maintenance, and emergency procedures, for electrical systems and equipment.

1.2 DEFINITIONS

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

1.3 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 and Commissioning Authority 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. Format: Submit operation and maintenance manuals in the following format:

1. Submit on digital media acceptable to Architect. Enable reviewer comments on draft submittals.
2. Submit three paper copies. Architect will return two copies.

C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect and Commissioning Authority will comment on whether general scope and content of manual are acceptable.

D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect and Commissioning Authority will return copy with comments.

1. Correct or revise each manual to comply with Architect's and Commissioning Authority's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's and Commissioning Authority's comments and prior to commencing demonstration and training.

E. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.4 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.

   a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
   b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.

3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment. Enclose title pages and directories in clear plastic sleeves.

4. Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

   a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.

   b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

1.5 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 to contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Construction Manager.
7. Name and contact information for Architect.
8. Name and contact information for Commissioning Authority.
9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
10. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. 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 in accordance with ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

1.6 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY MANUAL

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals. List items and their location to facilitate ready access to desired information. Include the following:

1. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
2. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
3. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

1.7 EMERGENCY MANUALS

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
B. Content: Organize manual into a separate section for each of the following:

   1. Type of emergency.
   2. Emergency instructions.
   3. Emergency procedures.

C. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

   1. Fire.
   2. Flood.
   3. Gas leak.
   4. Water leak.
   5. Power failure.
   6. Water outage.
   7. System, subsystem, or equipment failure.
   8. Chemical release or spill.

D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
E. Emergency Procedures: Include the following, as applicable:

   1. Instructions on stopping.
   2. Shutdown instructions for each type of emergency.
   3. Operating instructions for conditions outside normal operating limits.

4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

1.8 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.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

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.

1.9 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.

   1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
   2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds as described below.

C. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

    a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

E. 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.

F. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

G. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

I. 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.

J. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of maintenance manuals.

1.10 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. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. 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.

E. 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.

F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

G. 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 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings.
2. Record specifications.
3. Record Product Data.
4. Miscellaneous record submittals.

B. Related Requirements:

1. Section 011200 "Multiple Contract Summary" for coordinating Project Record Documents covering the Work of multiple contracts.
2. Section 017300 "Execution" for final property survey.
3. Section 017700 "Closeout Procedures" for general closeout procedures.
4. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set(s) of marked-up record prints.
2. Number of Copies: Submit copies of Record Drawings as follows:

a. Initial Submittal:

1) Submit one paper-copy set(s) of marked-up record prints.
2) Submit PDF electronic files of scanned record prints and one set(s) of file prints.
3) Submit Record Digital Data Files and one set(s) of plots.

4) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.

b. Final Submittal:

1) Submit three paper-copy set(s) of marked-up record prints.
2) Submit PDF electronic files of scanned Record Prints and three set(s) of file prints.
3) Print each drawing, whether or not changes and additional information were recorded.

c. Final Submittal:

1) Submit one paper-copy set(s) of marked-up record prints.
2) Submit Record Digital Data Files and three set(s) of Record Digital Data File plots.
3) Plot each drawing file, whether or not changes and additional information were recorded.

B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and Contract modifications.
C. Record Product Data: Submit annotated PDF electronic files of each submittal.

1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files of each submittal.

E. Reports: Submit written report weekly indicating items incorporated into Project Record Documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

1.4 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. Depths of foundations.
d. Locations and depths of underground utilities.
e. Revisions to routing of piping and conduits.
f. Revisions to electrical circuitry.
g. Actual equipment locations.
h. Duct size and routing.
i. Locations of concealed internal utilities.
j. Changes made by Change Order or Change Directive.
k. Changes made following Architect's written orders.
l. Details not on the original Contract Drawings.
m. Field records for variable and concealed conditions.
n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record prints with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:

1. Format: Same digital data software program, version, and operating system as for the original Contract Drawings.
2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
3. Refer instances of uncertainty to Architect for resolution.
4. Architect will furnish Contractor with one set of digital data files of the Contract Drawings for use in recording information.

    a. See Section 013100 "Project Management and Coordination" for requirements related to use of Architect's digital data files.
    b. Architect will provide data file layer information. Record markups in separate layers.

C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file with comment function enabled.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:

    a. Project name.
    b. Date.
    c. Designation "PROJECT RECORD DRAWINGS."
    d. Name of Architect.
    e. Name of Contractor.

1.5 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation, where installation varies from that indicated in Specifications, addenda, and Contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.

4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
5. Note related Change Orders and Record Drawings where applicable.

B. Format: Submit record specifications as annotated PDF electronic file.

1.6 RECORD PRODUCT DATA

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and revisions to Project Record Documents as they occur; do not wait until end of Project.
B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.

3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

C. Format: Submit Record Product Data as annotated PDF electronic file.

1. Include Record Product Data directory organized by Specification Section number and title, electronically linked to each item of Record Product Data.

1.7 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
B. Format: Submit miscellaneous record submittals as PDF electronic file.

1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

1.8 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 01 79 00
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.

B. Allowances: Furnish demonstration and training instruction time under the demonstration and training allowance as specified in Section 012100 "Allowances."

C. Unit Price for Instruction Time: Length of instruction time will be measured by actual time spent performing demonstration and training in required location. No payment will be made for time spent assembling educational materials, setting up, or cleaning up. See requirements in Section 012200 "Unit Prices."

1.2 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

B. Attendance Record: For each training module, submit list of participants and length of instruction time.
C. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.3 CLOSEOUT SUBMITTALS

A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.

1. Identification: On each copy, provide an applied label with the following information:

a. Name of Project.
b. Name and address of videographer.
c. Name of Architect.
d. Name of Construction Manager.
e. Name of Contractor.
f. Date of video recording.

2. Transcript:

a. Prepared and bound in format matching operation and maintenance manuals. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding video recording. Include name of Project and date of video recording on each page.
b. Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.

3. At completion of training, submit complete training manual(s) for Owner's use prepared in same paper and PDF file format required for operation and maintenance manuals specified in Section 017823 "Operation and Maintenance Data."

1.4 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, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.
C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.

D. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:

    1. Inspect and discuss locations and other facilities required for instruction.
    2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
    3. Review required content of instruction.
    4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.5 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed and approved by Architect.

1.6 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

    1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

        a. System, subsystem, and equipment descriptions.
        b. Performance and design criteria if Contractor is delegated design responsibility.
        c. Operating standards.
        d. Regulatory requirements.

e. Equipment function.
f. Operating characteristics.
g. Limiting conditions.
h. Performance curves.

2. Documentation: Review the following items in detail:

a. Emergency manuals.
b. Systems and equipment operation manuals.
c. Systems and equipment maintenance manuals.
d. Product maintenance manuals.
e. Project Record Documents.
f. Identification systems.
g. Warranties and bonds.
h. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

a. Instructions on meaning of warnings, trouble indications, and error messages.
b. Instructions on stopping.
c. Shutdown instructions for each type of emergency.
d. Operating instructions for conditions outside of normal operating limits.
e. Sequences for electric or electronic systems.
f. Special operating instructions and procedures.

4. 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.

5. Adjustments: Include the following:

a. Alignments.
b. Checking adjustments.
c. Noise and vibration adjustments.

d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

   a. Diagnostic instructions.
   b. Test and inspection procedures.

7. 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.

8. 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.

1.7 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."
B. Set up instructional equipment at instruction location.

1.8 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.

2. Owner will furnish an instructor to describe Owner's operational philosophy.
3. Owner will furnish Contractor with names and positions of participants.

C. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner, through Architect, with at least seven days' advance notice.

D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of an oral performance-based test.
F. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

1.9 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 megapixels and capable of recording in full HD mode with vibration reduction technology.

1. Submit video recordings on CD-ROM or thumb drive.
2. File Hierarchy: Organize folder structure and file locations in accordance with Project Manual table of contents. Provide complete screen-based menu.
3. File Names: Utilize file names based on name of equipment generally described in video segment, as identified in Project specifications.

4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the equipment demonstration and training recording that describes the following for each Contractor involved on the Project, arranged in accordance with Project Manual table of contents:

    a. Name of Contractor/Installer.
    b. Business address.
    c. Business phone number.
    d. Point of contact.
    e. Email address.

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.

    1. Film training session(s) in segments not to exceed 15 minutes.

        a. Produce segments to present a single significant piece of equipment per segment.
        b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
        c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.

D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.

    1. Furnish additional portable lighting as required.

E. Narration: Describe scenes on video recording by audio narration by microphone while video recording is recorded. Include description of items being viewed.
F. Transcript: Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.
G. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

PART 2 - PRODUCTS (NOT USED)
PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 05 50 00
METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Miscellaneous framing and supports for piles, ramps, and utilidor.

1.2 COORDINATION

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

1.3 ACTION SUBMITTALS

A. Product Data:

1. Fasteners.
2. Shop primers.
3. Galvanization.

B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:

1. Miscellaneous framing and supports for applications where framing and supports are not specified in other Sections.

1.4 INFORMATIONAL SUBMITTALS

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

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with the following welding codes:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.6 FIELD CONDITIONS

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

PART 2 - PRODUCTS

2.1 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
B. Steel Plates: ASTM A529 or A572, Fy = 50 ksi.
C. Wide flanges, Tees: ASTM A992, Fy = 50 ksi.
D. Angles, channels, rods: ASTM A36, Fy = 36 ksi.
E. Pipe: ASTM A53, Grade B, Fy = 35 ksi.

2.2 FASTENERS

A. General: Unless otherwise indicated, provide hot-dip galvanized complying with ASTM A153 or zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, for exterior use and at exterior walls. Select fasteners for type, grade, and class required.
B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.
C. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 3, heavy-hex steel structural bolts; ASTM A563, Grade DH3, heavy-hex carbon-steel nuts; and where indicated, flat washers.

2.3 MISCELLANEOUS MATERIALS

A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

    1. Use primer that contains pigments that make it easily distinguishable from zinc-rich primer.

B. Water-Based Primer: Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.
C. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
D. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
E. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
F. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.4 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
D. Form exposed work with accurate angles and surfaces and straight edges.
E. Weld corners and seams continuously to comply with the following:

    1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
    2. Obtain fusion without undercut or overlap.
    3. Remove welding flux immediately.
    4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

2.5 MISCELLANEOUS FRAMING AND SUPPORTS

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

    1. Fabricate units from slotted channel framing where indicated.
    2. Furnish inserts for units installed after concrete is placed.

C. Fabricate steel beams and other miscellaneous steel shapes of sizes indicated.

   1. Provide bearing plates welded to beams where indicated.
   2. Drill or punch girders and plates for field-bolted connections where indicated.
   3. Where wood nailers are attached to girders with bolts or lag screws, drill or punch holes at 24 inches o.c.

D. Galvanize miscellaneous framing and supports where indicated.

2.6 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.7 GENERAL FINISH REQUIREMENTS

A. Finish metal fabrications after assembly.
B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.8 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.

   1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean galvanized surfaces of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location,

alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

3.2 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

3.3 REPAIRS

A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

    a. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION

SECTION 05 51 10
METAL RAILINGS

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Section 05 12 00 – Structural and Miscellaneous Steel

B. Section 09 91 00 – Pa

1.2WORK SUPPLIED BUT INSTALLED UNDER OTHER SECTIONS

A. Inserts and anchorage's necessary for embedment into building prior to this work.

1.3APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this Specification. In case of conflict only the most stringent shall apply.

1. 2012 International Building Code (IBC): Sections 1012, 1013 and 1607.8.
2. American Welding Society (AWS) "Code for Welding in Building Construction".
3. Americans with Disabilities Act "Accessibility Guidelines for Buildings and Facilities." (ADAAG)
4. ASTM A36 – Specification for Carbon Structural Steel.
5. ASTM A123 - Specification for Zinc (Hot Galvanized) Coatings on Iron and Steel Products.
6. ASTM A153 - Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
7. ASTM A307 - Specification for Carbon Steel Bolts and Studs, 60 000 psi Tensile Strength.
8. ASTM A312 - Specification for Seamless and Welded Austenitic Stainless Steel Pipe.
9. ASTM A385 - Practice for Providing High-Quality Zinc Coatings (Hot-Dip).
10. ASTM A501 – Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
11. ASTM A500 - Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
12. ASTM A554 - Specification for Welded Stainless Steel Mechanical Tubing.
13. ASTM A780 - Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

14. ASTM B241 - Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube.
15. ASTM B429 - Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
16. ASTM E935 – Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.
17. ASTM E985 – Standard Specifications for Permanent Metal Railing Systems and Rails for Buildings.
18. ASTM F436 – Specification for Hardened Steel Washers.
19. Society for Protective Coatings Standards and Specifications (SPC).

1.4 SUBMITTALS

A. Shop Drawings and Manufacturer's Descriptive Literature: Indicating shop and erection details shall be submitted, including dimensions, profiles, materials, finishes, splices and attachments, typical details, and manufacturer's installation recommendations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. The DRAWINGS are in part diagrammatic to allow for maximum selection to meet design conditions. Completed railings shall meet the IBC1607 and be designed and certified by an Alaska engineer as a IBC deferred submittal:

1. Public area stairs and floor openings (unless rail runs along solid wall): intermediate vertical rails so that a sphere four inches in diameter cannot pass through.
2. Installed railings shall resist a load of 50 pounds per lineal foot and a 250-pound concentrated load applied in any direction at any point on the handrail per ASTM E935 without damage. Lineal loads and concentrated loads need not be concurrent.
3. Intermediate rails, panel fillers and their connections shall be capable of withstanding a force of 50 pounds per square foot horizontal applied over entire tributary area including openings and spaces between rails. Reactions due to this need not be superimposed with the rail force.
4. Extend railing continuous with smooth curves returning ends to walls and around corners without projections that snag clothing or catch fingers and allow continuous sliding of hands.
5. Inside handrails on switchback stairs shall be continuous between flights. Provide a minimum clearance of 1-1/2 inches between handrail and adjacent construction.
6. Extend hand railing beyond top and bottom landings in accord with IBC.

2.2STEEL MATERIALS

A. Plate and Bar: ASTM A36/A 36M or ASTM 572/A 572M, Grade 50

B. Cold-Formed Hollow Structural Sections: ASTM A500, grade B, structural tubing, or ASTM A501 hot formed.

C. Steel Pipe: ASTM A53/ A 53M, Type E or S, Grade B

D. Welding Electrodes: Comply with AWS requirements.

E. Welding Materials: AWS D1.1; type required for materials being welded.

2.3RAILINGS

A. 1.25 to 2 inches outside diameter round tube Handrails.

B. Materials:

1. Round Tube Carbon Steel: ASTM A500 and A501, minimum 2.7 pounds per lineal foot.
2. Base Plates: for floor mounting: 1/4-inch minimum thick steel to match supported railings.

C. Rails Outside of Building: Carbon Steel: hot dip galvanized after fabrication in accord with ASTM A123.

D. Galvanized steel requires no further finish except touch up: SPC Paint 20 inorganic zinc rich primer, silver color at abrasions and any field welds after grinding away sharp protrusions.

2.4FITTINGS AND CONNECTIONS

A. Same material as rails.

B. Mechanical with minimum of exposed fasteners or shop welded.

C. Welding to be done to maximum extent in shop, grind smooth.

D. Exposed connection finish shall match pipe rails.

E. Provide smooth, rounded closures for exposed ends of pipe.

2.5THREADED FASTENERS

A. Exposed fasteners shall be flush with handrail surface and as specified in

Fabrication.

B. Steel Bolts and Nuts: ASTM A307 Grade A. Galvanized per ASTM A153.

C. Plain Washers: ASTM F436 galvanized per ASTM A153.

D. Anchor Bolts: 1/2-inch minimum diameter, sufficiently long for through bolting structure or 6-inch embedment into concrete or masonry. Provide hex head or similarly deform embedded end of anchor bolts.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine DRAWINGS and field conditions to receive railings and ladders for defects that will adversely affect the work, and for deviation beyond allowable tolerances.

B. Beginning installation shall mean acceptance of existing conditions as capable of producing an acceptable job.

3.2 FABRICATION

A. Work shall be done the maximum extent possible in the shop to minimize field splicing. Provide 3/8-inch drain holes in enclosed tubing to drain in erected position.

B. Fasteners: Concealed wherever possible.

C. Bends: Form to uniform radius free from buckles with finish surfaces free from scratches.

D. Welds: Minimum 3/16-inch continuous fillet or butt type per AWS.

E. Surface Finish: Grind any sharp edges smooth and remove weld slag, splatter and discoloration.

F. Galvanizing per ASTM A123 after fabrication: No unvented closed pipe sections. Lightly sandpaper or steel wool-galvanizing smooth on handrail surfaces.

3.3 INSTALLATION

A. In accordance with these specifications, approved shop drawings and manufacturer’s written recommendations.

B. Erect, plumb, level, or to alignment indicated. Grout may be used to 1/2-inch maximum thickness between base plates and concrete, finished smooth around base plate. If grout is used install permanent galvanized steel shims.

C. Joint copes, miters and butt joints exposed to view in completed work shall be in uniform contact (1/32-inch maximum space) or closed by welding, ground smooth.

D. Splices, connections and fasteners as necessary for a complete, rigid installation.

   1. Horizontal rails: no projections except countersunk or rounded button head fasteners.
   2. Vertical post anchors: shall not project more than 1/4-inch past nuts, cut off and remove burrs if necessary.

E. Do not cut or abrade members with finishes, which cannot be restored in the field. Touch up galvanized abrasion and damage with zinc rich paint.

F. Dissimilar Materials: Aluminum contacting steel, concrete, masonry, wood exposed to weather, and the like shall have the contact surfaces separated by a heavy coat of zinc chromate primer, bituminous paint, or non-absorptive tape. Separation materials shall not be visible in exposed completed work.

G. Cutting and Fitting: No torch cutting. Drill neatly to avoid weakening structure. Avoid placing fasteners in normal view where possible.

H. Grind surfaces smooth and without sharp edges.

3.4TOUCH UP PAINT

A. Apply zinc rich touch up SPC Paint 20 per ASTM A780 to field welds and bare metal areas of galvanized finishes.

3.5TOLERANCES

A. Maximum variation from plumb and level: 1/4 inch.

B. Maximum offset from true alignment: 1/4 inch.

END OF SECTION

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood products.
2. Wood-preservative-treated lumber.
3. Dimension lumber framing.
4. Miscellaneous lumber.
5. Plywood backing panels.

B. Related Requirements:

1. Section 061600 "Sheathing" for sheathing, subflooring, and underlayment.
2. Section 061753 "Shop-Fabricated Wood Trusses" for wood trusses made from dimension lumber.

1.2 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.
B. Dimension Lumber: Lumber of 2 inches nominal size or greater but less than 5 inches nominal size in least dimension.
C. Exposed Framing: Framing not concealed by other construction.

D. Lumber grading agencies, and abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NLGA: National Lumber Grades Authority.
3. SPIB: The Southern Pine Inspection Bureau.
4. WCLIB: West Coast Lumber Inspection Bureau.
5. WWPA: Western Wood Products Association.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates:

1. For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
2. For preservative-treated wood products. Indicate type of preservative used and net amount of preservative retained.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS

A. Lumber: Comply with DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry wood products.

4. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content:

1. Boards: 15 percent.
2. Dimension Lumber: 15 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1, Use categories as follows:

1. UC3A (All Other Commodity Specifications): Coated products excluding sawn products in exterior construction not in contact with ground, exposed to all weather cycles but protected from liquid water. Include the following items:

   a. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.

2. UC3B (Commodity Specification A): Uncoated sawn products in exterior construction not in contact with ground, exposed to all weather cycles including intermittent wetting but with sufficient air circulation for wood to dry. Excludes sawn products not in contact with ground but with ground contact-type hazards. Include the following items:

   a. Wood decking, railings, and joists and beams for decks that are not critical to the performance and safety of the entire system/construction and that are in locations easily accessible for maintenance, repair, or replacement.

3. UC4B (Commodity Specification A): Critical or difficult-to-replace sawn products in contact with ground and exposed to all weather cycles including continuous or prolonged wetting, high decay potential, and salt water splash. Include the following items:

   a. Wood foundations.

4. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
5. For exposed items indicated to receive a stained or natural finish, chemical formulations are not to require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
6. After treatment, redry to 19 percent maximum moisture content.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

    1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

D. Application: Treat items indicated on Drawings.

2.3 DIMENSION LUMBER FRAMING

A. Non-Load-Bearing Interior Partitions by Grade: Construction or No. 2 grade.

    1. Application: All interior partitions.
    2. Species:

        a. Hem-fir (north); NLGA.
        b. Southern pine or mixed southern pine; SPIB.
        c. Spruce-pine-fir; NLGA.
        d. Hem-fir; WCLIB, or WWPA.
        e. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
        f. Northern species; NLGA.
        g. Eastern softwoods; NeLMA.
        h. Western woods; WCLIB or WWPA.

2.4 MISCELLANEOUS LUMBER

A. Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

    1. Blocking.
    2. Nailers.
    3. Cants.
    4. Furring.
    5. Grounds.
    6. Utility shelving.

B. Dimension Lumber Items: No. 1-grade lumber or better of any of the following species:

    1. Hem-fir (north); NLGA.
    2. Hem-fir; WCLIB or WWPA.
    3. Western woods; WCLIB or WWPA.

4. Northern species; NLGA.

C. Roofing Nailers: No. 1-grade lumber or better; kiln-dried Douglas fir, southern pine, or wood having similar decay-resistant properties.
D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

2.5 FASTENERS

A. General: Fasteners are to be of size and type indicated and comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches into wood substrate.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153 or ASTM F2329.

B. Nails, Brads, and Staples: ASTM F1667.
C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

2.6 METAL FRAMING ANCHORS

A. Post bases, joist ties, rafter tie-downs, and hold-downs as indicated on the Drawings.
B. Materials: Unless otherwise indicated, fabricate from the following materials:

1. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653, G60 coating designation.

a. Use for interior locations unless otherwise indicated.

2. Heavy-Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.

a. Use for wood-preservative-treated lumber and where indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
B. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.
D. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

E. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.
F. Install sill sealer gasket/termite barrier in accordance with manufacturer's written instructions at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.
G. Do not splice structural members between supports unless otherwise indicated.
H. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

    1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

I. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:

    1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
    2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal thickness.

3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.
4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.

J. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
K. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

L. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
M. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. Table 2304.10.1, "Fastening Schedule," in ICC's International Building Code (IBC).
2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
3. ICC-ES evaluation report for fastener.

N. Securely attach roofing nailers to substrates by anchoring and fastening to withstand bending, shear, or other stresses imparted by Project wind loads and fastener-resistance loads as designed in accordance with ASCE/SEI 7.

O. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 INSTALLATION OF WOOD BLOCKING AND NAILERS

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
B. Attach wood blocking to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.
C. Attach wood roofing nailers securely to substrate to resist the designed outward and upward wind loads indicated on Drawings and in accordance with ANSI/SPRI ED-1, Tables A6 and A7.

D. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 INSTALLATION OF WALL AND PARTITION FRAMING

A. General: Provide single bottom plate and double top plates using members of 2-inch nominal thickness whose widths equal that of studs, except single top plate may be used for non-load-bearing partitions. Fasten plates to supporting construction unless otherwise indicated.

    1. For interior partitions and walls, provide 2-by-6-inch nominal- and 2-by-4-inch nominal- size wood studs as indicated on Drawings spaced 16 inches o.c. unless otherwise indicated.
    2. Provide continuous horizontal blocking at midheight of partitions more than 96 inches high, using members of 2-inch nominal thickness and of same width as wall or partitions.

B. Construct corners and intersections with three or more studs, except that two studs may be used for interior non-load-bearing partitions.
C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs.

    1. For non-load-bearing partitions, provide double-jamb studs and headers not less than 4-inch nominal depth for openings 48 inches and less in width, 6-inch nominal depth for openings 48 to 72 inches in width, 8-inch nominal depth for openings 72 to 120 inches in width, and not less than 10-inch nominal depth for openings 10 to 12 feet in width.

3.4 INSTALLATION OF FLOOR JOIST FRAMING

A. General: Install floor joists with crown edge up and support ends of each member with not less than 1-1/2 inches of bearing on wood or metal, or 3 inches on masonry. Attach floor joists as follows:

   1. Where supported on wood members, by toe nailing or by using metal framing anchors.
   2. Where framed into wood supporting members, by using wood ledgers as indicated or, if not indicated, by using metal joist hangers.

B. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 48 inches.
C. Provide solid blocking of 2-inch nominal thickness by depth of joist at ends of joists unless nailed to header or band.
D. Lap members framing from opposite sides of beams, girders, or partitions not less than 4 inches or securely tie opposing members together. Provide solid blocking of 2-inch nominal thickness by depth of joist over supports.
E. Provide solid blocking between joists under jamb studs for openings.

F. Provide bridging of type indicated below, at intervals of 96 inches o.c., between joists.

   1. Diagonal wood bridging formed from bevel-cut, 1-by-3-inch nominal-size lumber, double-crossed and nailed at both ends to joists.
   2. Steel bridging installed to comply with bridging manufacturer's written instructions.

END OF SECTION

SECTION 06 12 00
STRUCTURAL INSULATED PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural Insulated Panels (SIPs) and accessories.

B. Related Requirements:

1. Section 061000 “Rough Carpentry for requirements for miscellaneous framing, blocking, and nailers associated and not associated with installation of SIPs.
2. Section 061600 “Sheathing” for sheathing, subflooring, and underlayment.
3. Section 061753 “Shop-Fabricated Wood Trusses” for wood trusses made from dimension lumber.
4. Section 079219 “Joint Sealants: Caulking and Sealants” for caulking and joint sealants.

1.2 SYSTEM DESCRIPTION

A. Structural Insulated Panels (SIPs) consist of facings of performance-rated plywood or oriented strand board (OSB) structurally laminated to an expanded polystyrene rigid insulation core. SIP manufacturer-supplied accessories.
B. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.

1.3 REFERENCES

A. ANSI/APA PRS 610.1 - Standard for Performance Rated Structural Insulated Panels in Wall Applications.
B. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
C. ASTM D7446 - Standard Specification for Structural Insulated Panel (SIP) Adhesives for Laminating Oriented Strand Board (OSB) to Rigid Cellular Polystyrene Thermal Insulation Core Materials.

D. ASTM E72 – Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
E. ASTM E1803 – Standard Test Methods for Determining Structural Capacities of Insulated Panels.
F. DOC PS 2 - Performance Standard for Wood-Based Structural-Use Panels.
G. ICC-ES AC04 – Acceptance Criteria for Sandwich Panels.
H. ICC-ES AC05 - Acceptance Criteria for Sandwich Panel Adhesives.
I. ICC-ES AC12 – Acceptance Criteria for Foam Plastic Insulation.
J. ICC-ES AC239 – Acceptance Criteria for Termite-Resistant Foam-Plastics

1.4 PREINSTALLATION MEETINGS

A. Pre-Installation Conference: Conduct meeting to verify Project requirements, foundation/structural system/substrate conditions, SIP manufacturer's installation instructions, SIP manufacturer's warranty requirements, and requirements of authorities having jurisdiction.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Product Code Report: Provide copy of manufacturer's ICC-ES Report
2. Quality Assurance Program: Provide evidence of manufacturer's third-party quality assurance program.
3. Manufacturer's instructions: Provide manufacturer's Design Manual and Load Design Charts.
4. SIPA Membership: Provide certificate indicating SIPs manufacturer is a Structural Insulated Panel Association (SIPA) manufacturing member in good standing.

B. Installer: Installer shall have at least one of the following qualifications:

1. Field Supervisor having completed SIPA Registered Builder SIP Builder Training Program.
2. Field Supervisor having completed Carpenters International Training Fund (CITF) Program on Structural Insulated Panels.
3. Field Supervisor having completed training provided by the SIP manufacturer.
4. Field Supervisor shall have a minimum of three verifiable SIP installations in successful service.

C. Professional Engineer: Experienced professional engineer licensed in the State of Alaska.
D. SIP Manufacturer's Installation Instructions: Instructions shall be available onsite.

1.6 ACTION SUBMITTALS

A. Product Data: For SIPs and accessories.

1. ICC-ES Report.
2. Design Manual.
3. Load Design Charts.
4. R-values.
5. SIP Sealant Product Data
6. SIP Screw Product Data.
7. SIP Tape Product Data.

B. Shop Drawings: Show fabrication layout, supports required by this Section, and installation details for SIPs.

1. Indicate locations of structural supports not specified in this Section.
2. Indicate location and type of field-installed lumber.
3. Indicate type, size, and spacing requirements for fasteners.

C. Engineering: Provide structural calculations by a registered architect or professional engineer in the state of Alaska to verify SIPs meet project requirements.
D. Delegated Design: For SIPs indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Manufacturer, Installer , and Professional Engineer.
B. Product Code Report: ICC-ES Report in conformance with AC04.

1. Label each SIP with identification of third-party inspection agency and evaluation report number.

C. Product Code Report: Evaluation Report in conformance AC239 for termite resistant expanded polystyrene insulation core

1.8 CLOSEOUT SUBMITTALS

A. Warranty: Executed copy of manufacturer warranty meeting requirements of Warranty Article.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Handling: Unload and move SIPs using forklift or other means that fully support SIPs. Do not handle SIPs by top facing only.
B. Support: SIPs and SIP Accessories to be stored a minimum of 3 inches above ground/surface. Support SIPs flat on minimum of 3 in. wide stickers with length equal to the width of the SIPs with stickers placed no further than four feet on center, or equivalent.
C. Protection: Protect SIPs and SIP Accessories from exposure to the elements when stored onsite. Cover stored SIPs and SIP Accessories with secured protective covering.

1.10 WARRANTY

A. SIP Manufacturer Warranty: Warranty against material failure of SIPs installed according to manufacturer's instructions by qualified installer under normal use.

    1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer to design structural components.
B. Structural Performance: SIPs shall withstand the effects of design loads shown on approved SIP Manufacturer’s shop drawings without exceeding allowable design working stresses.

    1. Design Loads: As indicated on Structural Drawings.
    2. Maximum Deflection under Design Loads:

        a. Roof SIPs: Vertical deflection of L/240 of span under total load.
        b. Wall SIPs: Vertical deflection of L/240 of span under total load.
        c. Floor SIPs: Vertical deflection of L/360 of span under total load.

2.2 STRUCTURAL INSULATES PANELS (SIPs)

A. SIPs shall consist of the following panel construction:

1. Termite Resistant Expanded polystyrene insulation core complying with ASTM C578 Type I and ICC-ES AC239.
2. Performance-rated plywood or oriented strand board (OSB) facing in conformance with DOC PS 2 and complying with ANSI/APA PRS 610.1 Table 2.
3. Adhesive complying with the requirements of ASTM D7446 or ICC-ES AC05.

B. SIP Floor and Soffit: Thickness and R-value as indicated on the Drawings.
C. SIP Walls: Thickness and R-value as indicated on the Drawings.
D. SIP Roof: Thickness and R-value as indicated on the Drawings.

2.3 SIP ACCESSORIES

A. Splines: Block Splines and I-Beam Splines for joining SIPs in accordance with SIP manufacturer's shop drawings shall be supplied by SIP manufacturer.
B. Sealant: Sealant for sealing SIPs in accordance with SIP manufacturer's instructions shall be supplied by SIP manufacturer.
C. SIP Screws: SIP manufacturer-provided screws for attachment of SIPs in accordance with SIP manufacturer's instructions.
D. Nails: Nails for attachment of SIP connections in accordance with SIP manufacturer's instructions shall be supplied by Installer.
E. SIP Tape: Tape for sealing SIP joints in accordance with SIP manufacturer's instructions shall be supplied by SIPs manufacturer.
F. Lumber: Lumber required for installation of SIPs in accordance with SIP manufacturer's instructions shall be supplied by SIP manufacturer.

1. Pressure-Treated Wood Sill Plate: Refer to Section 061000 "Rough Carpentry."
2. Other Lumber: Refer to Section 061000 "Rough Carpentry."

G. Capillary Break Material: Material required for installation of SIPs in accordance with the SIP manufacturer's written instructions.

2.4 FABRICATION

A. General: Fabricate panels with specified facings of thickness to meet design criteria, pressure laminated to insulation core with aminating adhesive.
B. Exterior Finish: Apply specified finish material to exterior and interior of panels.
C. Panel Thickness: Nominal panel thickness in accordance with the Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify conditions of foundation/structural system/substrates and other conditions with erector present, for compliance with installation requirements.
B. Proceed with installation once non-complying conditions are corrected.

3.2 PANEL INSTALLATION

A. Installation: Handle and install SIPs in accordance with approved SIP manufacturer's shop drawings.
B. Splines: Install splines for joining SIPs in accordance with approved SIP manufacturer's shop drawings.
C. Sealant: Apply joint sealant for sealing SIPs in accordance with SIP manufacturer's written instructions.
D. Nails: Install nails for attachment of SIP connections in accordance with SIP manufacturer's shop drawings and SIP manufacturer's written instructions.
E. SIP Screws: Install SIP screws for attachment of SIPs in accordance with SIP manufacturer's shop drawings and SIP manufacturer's written instructions.
F. SIP Tape: Apply Tape for sealing SIP joints in accordance with SIP manufacturer's instructions.
G. Lumber: Install accessory lumber in accordance with approved SIP manufacturer's shop drawings and SIP manufacturer's written instructions.

3.3 INSTALLATION OF SIPs IN WALL CONSTRUCTION

A. Installation of SIP Walls on Wood Subfloors:

B. SIP Bottom Plate: Install lumber bottom plate on wood subfloors in accordance with approved SIP manufacturer's shop drawings and SIP manufacturer's instructions.

   1. SIP Installation: Refer to Section 3.2 for instructions.

C. SIP Cap Plate: Install cap plate on top of wall SIPs in accordance with approved SIP manufacturer's shop drawings and SIP manufacturer's instructions.
D. Weather-Resistant Barrier: Apply weather-resistant barrier immediately after SIPs installation is completed. SIPs exposed to rain, frost or snow must be allowed to dry prior to application of weather-resistant barrier.

3.4 INSTALLATION OF SIPs IN ROOF CONSTRUCTION

A. Support: Confirm support structure provides adequate bearing for SIPs to meet SIP manufacturer's requirements.
B. SIP Installation: Refer to Section 3.2 for instructions.
C. Roof Underlayment: Apply roof underlayment immediately (per APA TT-111B) after SIPs installation is completed. SIPs exposed to rain, frost or snow must be allowed to dry prior to application of roof underlayment.

3.5 INSTALLATION OF FLOOR SIPs

A. Support: Confirm support structure provides adequate bearing for SIPs to meet SIP manufacturer's requirements.
B. SIP Installation: Refer to Section 3.2 for instructions.

3.6 ADJUSTING

A. Remove SIPs which have been damaged or have become wet and replace with new SIPs prior to proceeding with SIP installation or other work associated with SIP installation.

3.7 PROTECTION

A. Cover wall panels with moisture barrier or final wall cladding as soon as practical after erection.

B. Protect roof panels from weather with temporary protection when rain, frost or snow is present or imminent. SIPs temporarily exposed to rain, frost or snow must be allowed to dry prior to covering.

END OF SECTION

SECTION 06 16 00
SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roof sheathing.
2. Floor sheathing.
3. Underlayment.
4. Sheathing joint-and-penetration treatment materials.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for plywood backing panels.
2. Section 061715 “Engineered Structural Wood” for prefabricated wood I-joists and prefabricated open-web joists.
3. Section 061753 “Shop-Fabricated Trusses” for wood trusses made from dimension lumber.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Roof sheathing.
2. Floor sheathing.
3. Sheathing joint-and-penetration treatment materials.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PANEL PRODUCTS

A. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
B. Factory mark panels to indicate compliance with applicable standard.

2.2 PRESERVATIVE-TREATED PLYWOOD

A. Preservative Treatment by Pressure Process: AWPA U1;
Use Category UC2 for interior construction not in contact with ground,
Use Category UC3b for exterior construction not in contact with ground, and
Use Category UC4a for items in contact with ground].

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

C. Application: Treat items indicated on Drawings and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.

2.3 ROOF SHEATHING

A. Plywood Sheathing, Roofs: DOC PS 1, Exposure 1, Structural I sheathing.

1. Span Rating: Not less than 48/24.
2. Nominal Thickness: Not less than 3/4 inch.
3. Edge Detail: Tongue and groove.

2.4 SUBFLOORING AND UNDERLAYMENT

A. Plywood Floor Sheathing: DOC PS 1, Exposure 1, Structural I sheathing.

1. Span Rating: Not less than 48/24.
2. Nominal Thickness: Not less than 1 1/8 inch.
3. Edge Detail: Tongue and groove.

B. Underlayment: Provide underlayment in nominal thicknesses indicated or, if not indicated, not less than 1/4 inch over smooth subfloors and not less than 3/8 inch over board or uneven subfloors.

1. Plywood Underlayment for Resilient Flooring: DOC PS 1 Exposure 1 Underlayment with fully sanded face.

2.5 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

   1. For roof and floor sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.

B. Nails, Brads, and Staples: ASTM F1667.

2.6 MISCELLANEOUS MATERIALS

A. Adhesives for Field Gluing Panels to Wood Framing: Formulation complying with ASTM D3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
C. Securely attach to substrate by fastening as indicated on the Drawings or complying with the following, whichever is more stringent:

   1. Table 2304.10.1, "Fastening Schedule," in the ICC's International Building Code.
   2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in the ICC's International Residential Code for One- and Two-Family Dwellings.
   3. ICC-ES evaluation report for fastener.

D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

E. Coordinate roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 INSTALLATION OF WOOD STRUCTURAL PANEL

A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
B. Fastening Methods: Fasten panels as indicated below:

1. Roof Sheathing:

    a. Nail to wood framing.

2. Floor Sheathing:

    a. Nail and glue to wood framing. Apply a bead of glue to framing as indicated on the Drawings.

3. Underlayment:

    a. Nail to subflooring.
    b. Space panels 1/32 inch apart at edges and ends.
    c. Fill and sand edge joints of underlayment receiving resilient flooring immediately before installing flooring.

END OF SECTION

SECTION 06 17 15
ENGINEERED STRUCTURAL WOOD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Prefabricated wood I-joists.
2. Prefabricated open-web wood joists.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for dimension lumber items associated with engineered structural wood.
2. Section 061753 "Shop-Fabricated Wood Trusses" for wood trusses made from dimension lumber.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include data on adhesives, fabrication, and protection.
2. For preservative-treated wood products, include manufacturer's written instructions for handling, storing, installing, and finishing treated material.
3. For connectors, include installation instructions.

B. Shop Drawings:

1. Submit wood floor and roof-framing layouts including dimension lumber, engineered wood products, and plated wood trusses. Include computer-generated design calculations for representative joist and beam types.
2. Identify location and magnitude of design loads on layouts and in member calculations.
3. Include alternate span loading design results in design calculations.
4. Identify metal connectors (joist, beam, post cap, anchors, etc.) by manufacturer and model number. Include a list of accessories required for installation at each connector (blocking, squash blocks, stiffeners, fasteners, etc.). Include allowable design loads for selected metal connectors in design calculation analysis.
5. Identify manufacturer's recommended installation details in layouts.
6. Provide documentation that allowable design stresses comply with allowable design properties of each product indicated.

1.3 INFORMATIONAL SUBMITTALS

A. Material Certificates: For preservative-treated wood products, from manufacturer. Indicate type of preservative used and net amount of preservative retained.
B. Research Reports: For engineered structural wood from ICC-ES.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program, complies with quality-control procedures in ASTM D5055 or ASTM D5456, and involves third-party inspection by an independent testing and inspecting agency acceptable to Engineer and authorities having jurisdiction.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store, stack, and handle engineered wood products to comply with recommendations of APA EWS E705.

    1. Store wrapped or banded together until ready for installation, on level well-drained area. Do not store in direct contact with the ground. Use stickers to separate bundles, spaced as recommended in writing by manufacturer.
    2. Store I-joists level with the webs vertically.

B. Do not stack other material on top of structural composite lumber or I-joists.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain each type of engineered wood product from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.

    1. Allowable design stresses, as published by manufacturer, are to meet or exceed those indicated. Manufacturer's published values are to be determined from empirical data or by rational engineering analysis and

demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.3 PREFABRICATED WOOD I-JOISTS

A. Prefabricated Units: I-shaped in cross section, made with solid lumber flanges and wood-based structural webs, let into and bonded to flanges. Comply with material requirements of, and with structural capacities established and monitored in accordance with, ASTM D5055.

1. Flange Material: Machine stress-rated (MSR)] lumber.
2. Web Material: OSB, Exposure 1.
3. Structural Properties: Depths and design values not less than those indicated.
4. Identification Marks:

    a. Factory mark I-joists with manufacturer's name, joist series, mill identification, manufacturing date and time, name of third-party inspection agency, and ICC/CCMC code report number. Repeat identification marks at minimum 12 ft. intervals.

2.4 PREFABRICATED OPEN-WEB TRUSSES

A. Prefabricated Units: Open-web trusses made with solid lumber chords and tubular steel open webs.

1. Flange Material: Machine stress-rated (MSR)] lumber.
2. Web Material: Tubular steel with minimum yield of 45,000 psi per ASTM 500, Grade C.
3. Structural Properties: Depths and design values not less than those indicated.
4. Identification Marks:

    a. Factory mark I-joists with manufacturer's name, joist series, mill identification, manufacturing date and time, name of third-party inspection agency, and ICC/CCMC code report number.

2.5 PRESERVATIVE TREATMENT

A. Description: Preservative treatment; AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3B for exterior construction not in contact with ground, and Use Category UC4A for items in contact with ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

2. For exposed items indicated to receive a stained or natural finish, chemical formulations must not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

2.6 FASTENERS

A. General: Fasteners are to be of size and type indicated and to comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches into wood substrate.
B. Nails, Brads, and Staples: ASTM F1667.
C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
D. Wood Screws and Lag Screws: ASME B18.2.1, ASME B18.6.1, or ICC-ES AC233.
E. Carbon Steel Bolts: ASTM A307 with ASTM A563 hex nuts and, where indicated, flat washers all hot-dip zinc coated.
F. Stainless Steel Bolts: ASTM F593, Alloy Group 1 or 2; with ASTM F594, Alloy Group 1 or 2 hex nuts and, where indicated, flat washers.

2.7 METAL FRAMING ANCHORS

A. Allowable design loads, as published by manufacturer, are to meet or exceed those indicated. Manufacturer's published values are to be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by qualified independent testing agency. Framing anchors are to be punched for fasteners adequate to withstand same loads as framing anchors.

B. I-Joist Hangers: U-shaped joist hangers with seat and nailing flanges, full depth of joist, as indicated on Drawings. Nailing flanges provide lateral support at joist top chord.

1. Thickness: As indicated on the Drawings.
2. Finish: Galvanized.

C. Top Flange Hangers: U-shaped joist hangers, full depth of joist, formed from metal strap with tabs bent to extend over and be fastened to supporting member.

1. Strap Width: As indicated on the Drawings.

2. Thickness: As indicated on the Drawings.

D. Bridging: Rigid, V-section, nailless type, 0.050 inch thick, length to suit joist size and spacing.
E. Post Bases: Adjustable-socket type for bolting in place with standoff plate to raise post 1 inch above base and with 2-inch-minimum side cover, socket 0.062 inch thick, and standoff and adjustment plates 0.108 inch thick.
F. Joist Ties: Flat straps, with holes for fasteners, for tying joists together over supports.

1. Width: As indicated on the Drawings.
2. Thickness: As indicated on the Drawings.
3. Length: As indicated on the Drawings.

G. Materials: Unless otherwise indicated, fabricate from the following materials:

1. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, G60 coating designation.

a. Use for interior locations unless otherwise indicated.

2. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A653/A653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.

a. Use for wood-preservative-treated lumber and where indicated.

2.8 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets:

1. Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.
2. Self-adhering sheet consisting of 64 mils of rubberized asphalt laminated on one side to 4-mil-thick, polyethylene-film reinforcement, and with release liner on adhesive side.

B. Flexible Flashing: Composite, self-adhesive, flashing product consisting of pliable, butyl rubber or rubberized-asphalt compound, bonded to high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce overall thickness of not less than 0.025 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

   1. Verify that joist flange widths match hanger widths.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Do not install in direct contact with concrete or masonry.
B. Where wood-preservative-treated members are installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

C. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

   1. Use treatment approved in writing by manufacturer.

3.3 INSTALLATION OF PREFABRICATED WOOD I-JOISTS

A. Install to comply with ESR report, manufacturer's written instructions, and applicable code.

   1. Install in dry, covered conditions where in-service moisture content of wood does not exceed 16 percent.
   2. Install metal framing connections in accordance with AWC's "National Design Specification (NDS) for Wood Construction." Install fasteners through each fastener hole.
   3. Install joists with top and bottom flanges within 1/2 inch of true vertical alignment, and support ends of each member with not less than 1-3/4 inches for end bearing and 3-1/2 inches for intermediate bearings.
   4. Provide temporary bracing to maintain lines and levels until permanent supporting members are in place.
   5. Provide lateral restraint at supports to prevent rotation, and along the compression flange of each joist.
   6. Completely install and properly nail hangers, rim joists, rim boards, blocking panels, and x-bracing as each joist is set.

B. Cantilevered portions of joists must not exceed a maximum length equal to one-third the adjacent span, and support only uniform loads, unless designed by a design professional and approved by authorities having jurisdiction.

   1. Temporarily secure ends of cantilevers with strut lines on both top and bottom flanges. Remove only as required to install permanent sheathing.

C. Cutting: Do not splice structural members between supports unless otherwise indicated.

   1. Do not cut, drill, or notch I-joist top and bottom flanges except for cutting to length.

3.4 INSTALLATION OF PREFABRICATED OPEN-WEB TRUSSES

A. Install to comply with ESR report, manufacturer's written instructions, and applicable code.

   1. Install in dry, covered conditions where in-service moisture content of wood does not exceed 16 percent.
   2. Install metal framing connections or beating seat connectors in accordance with AWC's "National Design Specification (NDS) for Wood Construction" and manufacturer's instructions. Install fasteners through each fastener hole.
   3. Install joists with top and bottom flanges within 1/2 inch of true vertical alignment, and support ends of each member with not less than the end bearing as required by the manufacturer.
   4. Provide temporary bracing to maintain lines and levels until permanent supporting members are in place.
   5. Provide lateral support to individual trusses and the entire system until the sheathing material has been applied.
   6. Completely install and properly nail hangers, rim joists, rim boards, blocking panels, and x-bracing as required as each truss is set.

END OF SECTION

SECTION 06 17 53
SHOP-FABRICATED WOOD TRUSSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood products for roof trusses.
2. Wood truss bracing.
3. Preservative-treated lumber.

1.2 ALLOWANCES

A. Provide wood truss bracing under the Metal-Plate-Connected Truss Bracing Allowance as indicated on the Drawings.

1.3 DEFINITIONS

A. Metal-Plate-Connected Wood Trusses: Planar structural units consisting of metal-plate-connected members fabricated from dimension lumber and cut and assembled before delivery to Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For wood-preservative-treated lumber**,** metal-plate connectors, metal truss accessories, and fasteners.
B. Shop Drawings: Show fabrication and installation details for trusses.

1. Show location, pitch, span, camber, configuration, and spacing for each type of truss required.
2. Indicate sizes, stress grades, and species of lumber.
3. Indicate locations of permanent bracing required to prevent buckling of individual truss members due to design loads.
4. Indicate locations, sizes, and materials for permanent bracing required to prevent buckling of individual truss members due to design loads.
5. Indicate type, size, material, finish, design values, orientation, and location of metal connector plates.
6. Show splice details and bearing details.

C. Delegated Design Submittals: For metal-plate-connected wood trusses indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For metal connector-plate manufacturer professional engineer and fabricator.

B. Material Certificates: For dimension lumber specified to comply with minimum specific gravity. Indicate species and grade selected for each use and specific gravity.

C. Product Certificates: For metal-plate-connected wood trusses, signed by officer of truss-fabricating firm.

D. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated lumber.
2. Metal-plate connectors.
3. Metal truss accessories.

1.6 QUALITY ASSURANCE

A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with quality-control procedures in TPI 1 for manufacture of connector plates.

1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer licensed in the state of Alaska.

B. Fabricator Qualifications: Shop that [participates in a recognized quality-assurance program, complies with quality-control procedures in TPI 1, and involves third-party inspection by an independent testing and inspecting agency acceptable to Architect and authorities having jurisdiction] [and] [is certified for chain of custody by an FSC-accredited certification body].

C. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Handle and store trusses to comply with recommendations in SBCA BCSI, "Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining, & Bracing Metal Plate Connected Wood Trusses."

   1. Store trusses flat, off of ground, and adequately supported to prevent lateral bending.
   2. Protect trusses from weather by covering with waterproof sheeting, securely anchored.
   3. Provide for air circulation around stacks and under coverings.

B. Inspect trusses showing discoloration, corrosion, or other evidence of deterioration. Discard and replace trusses that are damaged or defective.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer to design metal-plate-connected wood trusses.
B. Structural Performance: Metal-plate-connected wood trusses are to be capable of withstanding design loads within limits and under conditions indicated. Comply with requirements in TPI 1 unless more stringent requirements are specified below.

   1. Design Loads: As indicated on the Drawings.
   2. Maximum Deflection under Design Loads:

      a. Roof Trusses: Vertical deflection of L/360 of span for live and snow loads and L/240 of span for total loads.

C. Comply with applicable requirements and recommendations of TPI 1, TPI DSB, and SBCA BCSI.
D. Wood Structural Design Standard: Comply with applicable requirements in AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."

2.2 WOOD PRODUCTS

A. Lumber: DOC PS 20 and applicable rules of any rules-writing agency certified by the American Lumber Standard Committee (ALSC) Board of Review.

Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.
3. Provide dressed lumber, S4S.
4. Provide dry lumber with 19 percent maximum moisture content at time of dressing.

B. Minimum Chord Size for Roof Trusses: 2 by 6 inches nominal for both top and bottom chords.

C. Minimum Specific Gravity for Top Chords: 0.50.
D. Permanent Bracing: Provide wood bracing that complies with requirements for miscellaneous lumber in Section 061000 "Rough Carpentry."

2.3 PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1;
Use Category UC2 for interior construction not in contact with the ground,
Use Category UC3b for exterior construction not in contact with the ground,
and Use Category UC4a for items in contact with the ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
2. For exposed trusses indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

2.4 METAL CONNECTOR PLATES

A. Source Limitations: Obtain metal connectors plates from a single manufacturer.
B. Fabricate connector plates to comply with TPI 1.
C. Hot-Dip Galvanized-Steel Sheet: ASTM A653/A653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G60 coating designation; and not less than 0.036 inch thick.

1. Use for interior locations unless otherwise indicated.

D. Hot-Dip Heavy-Galvanized-Steel Sheet: ASTM A653/A653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.

1. Use for wood-preservative-treated lumber and where indicated.

2.5 FASTENERS

A. Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Provide fasteners for use with metal framing anchors that comply with written recommendations of metal framing manufacturer.
2. Where trusses are exposed to weather, in ground contact, made from pressure-preservative treated wood, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.

B. Nails, Brads, and Staples: ASTM F1667.

2.6 METAL FRAMING ANCHORS AND ACCESSORIES

A. Allowable design loads: Provide products with allowable design loads as published by manufacturer which meet or exceed those indicated. Manufacturer's published values are to be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors are to be punched for fasteners adequate to withstand same loads as framing anchors.

B. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, G60 coating designation.

1. Use for interior locations unless otherwise indicated.

C. Hot-Dip Heavy-Galvanized-Steel Sheet: ASTM A653/A653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.

1. Use for wood-preservative-treated lumber and where indicated.

D. Truss Tie-Downs (Hurricane or Seismic Ties): As indicated on the Drawings.

E. Roof Truss Clips: Angle clips for bracing bottom chord of roof trusses at non-load-bearing walls, 1-1/4 inches wide by 0.050 inch thick. Clip is fastened to truss through slotted holes to allow for truss deflection.
F. Floor Truss Hangers: U-shaped hangers, full depth of floor truss, with 1-3/4-inch-long seat; formed from metal strap 0.062 inch thick with tabs bent to extend over and be fastened to supporting member.

G. Roof Truss Bracing/Spacers: U-shaped channels, 1-1/2 inches wide by 1 inch deep by 0.040 inch thick, made to fit between two adjacent trusses and accurately space them apart, and with tabs having metal teeth for fastening to trusses.

2.7 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20, with dry film containing a minimum of 92 percent zinc dust by weight.

2.8 FABRICATION

A. Cut truss members to accurate lengths, angles, and sizes to produce close-fitting joints.
B. Fabricate metal connector plates to sizes, configurations, thicknesses, and anchorage details required to withstand design loads for types of joint designs indicated.
C. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly, with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.

    1. Fabricate wood trusses within manufacturing tolerances in TPI 1.

D. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

2.9 SOURCE QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform special inspections.

    1. Provide special inspector with access to fabricator's documentation of detailed fabrication and quality-control procedures that provide a basis for

inspection control of the workmanship and the fabricator's ability to conform to approved construction documents and referenced standards.
2. Provide special inspector with access to places where wood trusses are being fabricated to perform inspections.

B. Correct deficiencies in Work that special inspections indicate do not comply with the Contract Documents.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install wood trusses only after supporting construction is in place and is braced and secured.
B. If trusses are delivered to Project site in more than one piece, assemble trusses before installing.
C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.
D. Install and brace trusses according to TPI recommendations and as indicated.
E. Install trusses plumb, square, and true to line and securely fasten to supporting construction.
F. Space trusses as indicated; adjust and align trusses in location before permanently fastening.
G. Anchor trusses securely at bearing points; use metal truss tie-downs or floor truss hangers as applicable. Install fasteners through each fastener hole in metal framing anchors according to manufacturer's fastening schedules and written instructions.

H. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.

1. Install bracing to comply with Section 061000 "Rough Carpentry."
2. Install and fasten strongback bracing vertically against vertical web of parallel-chord floor trusses at centers indicated.

I. Install wood trusses within installation tolerances in TPI 1.
J. Do not alter trusses in field. Do not cut, drill, notch, or remove truss members.

K. Replace wood trusses that are damaged or do not comply with requirements.

1. Damaged trusses may be repaired according to truss repair details signed and sealed by the qualified professional engineer responsible for truss design, when approved by Engineer.

3.2 REPAIRS AND PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect wood trusses from weather. If, despite protection, wood trusses become wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

C. Repair damaged galvanized coatings on exposed surfaces in accordance with ASTM A780/A780M and manufacturer's written instructions.

END OF SECTION

SECTION 06 18 00
GLUED-LAMINATED CONSTRUCTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural glued-laminated timber.
2. Timber connectors.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for dimension lumber items associated with structural glued-laminated timber.
2. Section 061715 “Engineered Structural Wood” for prefabricated wood I-joists and prefabricated open-web joists.

1.2 DEFINITIONS

A. Structural Glued-Laminated (Glulam) Timber: An engineered, stress-rated timber product assembled from selected and prepared wood laminations bonded together with adhesives and with the grain of the laminations approximately parallel longitudinally.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include data on lumber, adhesives, fabrication, and protection.
2. For preservative-treated wood products. Include chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
3. For connectors. Include installation instructions.

B. Shop Drawings:

1. Show layout of structural glued-laminated timber system and full dimensions of each member.
2. Indicate species and laminating combination.
3. Include large-scale details of connections.

1.4 INFORMATIONAL SUBMITTALS

A. Certificates of Conformance: Issued by a qualified testing and inspecting agency indicating that structural glued-laminated timber complies with requirements in ANSI A190.1.

B. Material Certificates: For preservative-treated wood products, from manufacturer. Indicate type of preservative used and net amount of preservative retained.

C. Research/Evaluation Reports: For structural glued-laminated timber and timber connectors, from ICC-ES.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: An AITC- or APA-EWS-licensed firm.

1.6 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with provisions in AITC 111.

B. Individually wrap members using plastic-coated paper covering with water-resistant seams.

PART 2 - PRODUCTS

2.1 STRUCTURAL GLUED-LAMINATED TIMBER

A. General: Provide structural glued-laminated timber that complies with ANSI A190.1 and ANSI 117 or research/evaluation reports acceptable to authorities having jurisdiction.

1. Factory mark each piece of structural glued-laminated timber with AITC Quality Mark or APA-EWS trademark. Place mark on surfaces that are not exposed in the completed Work.
2. Provide structural glued-laminated timber made from single species.
3. Provide structural glued-laminated timber made from solid lumber laminations; do not use laminated veneer lumber.
4. Provide structural glued-laminated timber made with wet-use adhesive complying with ANSI A190.1.

B. Species and Grades for Structural Glued-Laminated Timber:

1. Douglas fir-larch that complies with beam stress classifications indicated.

C. Species and Grades: For beams and] purlins.

1. Species and Beam Stress Classification: Douglas fir-larch, 24F-1.8E.
2. Lay-up: Balanced.

D. Appearance Grade: Industrial, complying with AITC 110.

2.2 PRESERVATIVE TREATMENT

A. Preservative Treatment: Where preservative-treated structural glued-laminated timber is indicated, comply with AWPA U1, Use Category 3B.

B. Preservative. One of the following:

1. Oxine copper (copper-8-quinolinolate) in a light petroleum solvent.
2. Copper naphthenate in a light petroleum solvent.
3. Ammoniacal zinc copper arsenate (ACZA) in a water solution.
4. Chromated copper arsenate (CCA) in a water solution.
5. Ammoniacal copper quat Type A (ACQ-C) in a water solution.

C. After dressing members, apply a copper naphthenate field-treatment preservative to comply with AWPA M4 to surfaces cut to a depth of more than 1/16 inch.

2.3 TIMBER CONNECTORS

Unless noted otherwise in the Drawings:

A. Fabricate beam seats from steel with 3/8-inch bearing plates, 3/4-inch-diameter-by-12-inch-long deformed bar anchors, and 0.239-inch side plates.

B. Fabricate beam hangers from steel with 0.179-inch stirrups and 0.239-inch top plates.

C. Fabricate strap ties from steel, 2-1/2 inches wide by 0.179 inch thick.

D. Fabricate tie rods from round steel bars with upset threads connected with forged-steel turnbuckles complying with ASTM A668.

E. Provide bolts, 3/4 inch unless otherwise indicated, complying with ASTM A307, Grade A; nuts complying with ASTM A563; and, where indicated, flat washers.

F. Materials: Unless otherwise indicated, fabricate from the following materials:

1. Structural-steel shapes, plates, and flat bars complying with ASTM A36.
2. Round steel bars complying with ASTM A575, Grade M 1020.
3. Hot-rolled steel sheet complying with ASTM A1011, Structural Steel, Type SS, Grade 33.
4. Stainless steel flat bars complying with ASTM A666, Type 316.
5. Stainless steel bars and shapes complying with ASTM A276, Type 316.
6. Stainless steel plate, sheet, and strip complying with ASTM A240 or ASTM A666, Type 316.

G. Finish steel assemblies and fasteners with rust-inhibitive primer, 2-mil dry film thickness.

H. Hot-dip galvanize steel assemblies and fasteners after fabrication to comply with ASTM A123 or ASTM A153.

2.4 MISCELLANEOUS MATERIALS

A. End Sealer: Manufacturer's standard, transparent, colorless wood sealer that is effective in retarding the transmission of moisture at cross-grain cuts and is compatible with indicated finish.

B. Penetrating Sealer: Manufacturer's standard, transparent, penetrating wood sealer that is compatible with indicated finish.

2.5 FABRICATION

A. Shop fabricate for connections to greatest extent possible, including cutting to length and drilling bolt holes.

   1. Dress exposed surfaces as needed to remove planing and surfacing marks.

B. Camber: Fabricate horizontal and inclined members of less than 1:1 slope with either circular or parabolic camber equal to 1/500 of span.

C. Where preservative-treated members are indicated, fabricate (cut, drill, surface, and sand) before treatment to greatest extent possible. Where fabrication must be done after treatment, apply a field-treatment preservative to comply with AWPA M4.

   1. Use inorganic boron (SBX) treatment for members not in contact with the ground and continuously protected from liquid water.
   2. Use copper naphthenate treatment for members in contact with the ground or not continuously protected from liquid water.

D. End-Cut Sealing: Immediately after end cutting each member to final length, apply a saturation coat of end sealer to ends and other cross-cut surfaces, keeping surfaces flood coated for not less than 10 minutes.

E. Seal Coat: After fabricating, sanding, and end-coat sealing, apply a heavy saturation coat of penetrating sealer on surfaces of each unit.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates in areas to receive structural glued-laminated timber, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Erect structural glued-laminated timber true and plumb and with uniform, close-fitting joints. Provide temporary bracing to maintain lines and levels until permanent supporting members are in place.

1. Handle and temporarily support glued-laminated timber to prevent surface damage, compression, and other effects that might interfere with indicated finish.

B. Cutting: Avoid extra cutting after fabrication. Where field fitting is unavoidable, comply with requirements for shop fabrication.

C. Fit structural glued-laminated timber by cutting and restoring exposed surfaces to match specified surfacing and finishing.

1. Predrill for fasteners using timber connectors as templates.
2. Finish exposed surfaces to remove planing or surfacing marks and to provide a finish equivalent to that produced by machine sanding with No. 120 grit sandpaper.
3. Coat cross cuts with end sealer.
4. Where preservative-treated members must be cut during erection, apply a field-treatment preservative to comply with AWPA M4.

    a. Use inorganic boron (SBX) treatment for members not in contact with the ground and continuously protected from liquid water.
    b. Use copper naphthenate treatment for members in contact with the ground or not continuously protected from liquid water.

D. Install timber connectors as indicated.

1. Unless otherwise indicated, install bolts with same orientation within each connection and in similar connections.
2. Install bolts with orientation as indicated or, if not indicated, as directed by Architect.

3.3 ADJUSTING

A. Repair damaged surfaces and finishes after completing erection. Replace damaged structural glued-laminated timber if repairs are not approved by Architect.

3.4 PROTECTION

A. Do not remove wrappings on individually wrapped members until they no longer serve a useful purpose, including protection from weather, sunlight, soiling, and damage from work of other trades.

1. Coordinate wrapping removal with finishing work. Retain wrapping where it can serve as a painting shield.
2. Slit underside of wrapping to prevent accumulation of moisture inside the wrapping.

END OF SECTION

SECTION 06 20 10
FINISH CARPENTRY AND ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Section 06 10 00 - Rough Carpentry
B. Section 06 41 16 - Laminate Faced Cabinets
C. Section 07 63 10 - Flashing and Trim
D. Section 07 92 00 - Joint Sealants
E. Section 08 11 10 - Hollow Steel Doors and Frames
F. Section 09 21 16 - Gypsum Board Assemblies
G. Section 09 91 00 - Painting

1.2 WORK FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

A. Special hangers or anchorage necessary for mounting that must be built into the structure.

1.3 DEFINITION

A. “Finish carpentry and architectural woodwork” shall mean exposed wood trim, paneling, and custom woodwork not specified in Section 06 41 00 - Custom Casework.

1.4 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this Specification. The publications may be referenced in the text by basic designation only. In case of conflict only the most stringent shall apply.

1. ASTM E84 – Test Method for Surface Burning Characteristics of Building Materials.
2. Architectural Woodwork Institute (AWI) “Architectural Woodwork Standards.”

3. U.S. Department of Commerce “American Softwood Lumber Standard”, PS-20.
4. U.S. Department of Commerce “Product Standard for Plywood”, PS-1.
5. U. S. Department of Commerce - Commercial Standard (CS) - Hardboard CS251.
6. National Electrical Manufacturer’s Association (NEMA) Publications for General Purpose Grade High Pressure Decorative Plastic Laminate.
7. International Building Code (IBC) Chapter 23.
8. American National Standards Institute/Builders Hardware Manufacturers Association ANSI/BHMA A156.9 “American National Standard for Cabinet Hardware.”
9. ANSI A208.1 Particleboard.
10. ANSI A208.2 Medium Density Fiberboard.

B. Lumber Grading: In accordance with the American Lumber Standards and the grading rules of the grading agency covering the species involved or AWI.

1.5QUALITY ASSURANCE

A. Perform finish carpentry and woodwork in accordance with AWI Quality Standards for “Custom” grade.
B. Particle board and plywood shall be tested and certified for reduced formaldehyde emission under National Particle Board and The Hardwood Plywood Manufacturer’s Quality Control Program.

1.6SUBMITTALS

A. Shop Drawings: Including dimensions, location, finishes, materials, fasteners, hardware literature, typical joint details, erection details and the like.
B. Samples:

1. Plastic laminate: full line of an approved manufacturer’s standard including premium solid and textured colors for selection.
2. Interior wood trim and paneling with proposed finish, 6 inches minimum size.

1.7STORAGE AND PROTECTION

A. Protect materials from prolonged exposure to the weather until permanently installed into construction.
B. Store interior woodwork inside building 14 days minimum and at same temperature and humidity conditions as will occur after occupancy.

PART 2 - PRODUCTS

2.1 ENVIRONMENTAL CONSIDERATIONS

A. To the maximum extent possible, provide materials with 20% minimum recycled content.
B. Provide mastics, adhesives and binders with low VOC emissions.

2.2 INTERIOR WOOD TRIM

A. AWI “Custom Grade” or Grade I or II clear or select white birch. Same species and cut shall be used throughout each area.
B. Each piece shall be similar for color and grain with smooth planed surface and eased edges.

2.3 PLYWOOD

A. AD grade, smooth sanded interior type with exterior glue per PS-1.
B. Douglas Fir face veneer.
C. Interior use plywood: certified for reduced formaldehyde emission.
D. Size and thickness as per DRAWINGS.

2.4 PARTICLE BOARD

A. In accord with ANSI 208.1: 40 to 50 pound per cubic 20% recycled content density made and stamp identified with reduced formaldehyde emissions, face screw holding of 225 pounds minimum, “Uniboard”.

2.5 MEDIUM DENSITY FIBER BOARD (MDF)

A. In accord with ANSI 208.2 free screw holding of 225 pounds minimum made and stamp identified with no added formaldehyde and 20% recycled content: “Sierrapine”: www.sierrapine.com , or “Temstock-Free”: www.buildgp.com

2.6 HARDBOARD

A. Tempered high density 1/4 inch minimum thick per CS 251.
B. Certified for reduced formaldehyde emission.

2.7 CASEWORK: SPECIFIED IN SECTION 06 41 16 – LAMINATE FACED CABINETS.

2.8 HIGH PRESSURE DECORATIVE PLASTIC LAMINATE

A. 0.048 inch (1.0 mm) minimum thick, meeting NEMA general-purpose grade VGS or VGL requirements. 0.028 inch (0.7 mm) may be used for vertical use. Backer sheets may be BKL 0.020 inch (0.5 mm) thick.

   1. Nevamar Corporation.
   2. Formica.
   3. Wilson Art.
   4. Abet Laminati

B. Finish: Manufacturer's standard texture and matt solid colors.
C. A maximum of (4) different colors will be used.

   1. Plastic laminate backing same thickness as face, tan color, backing grade.

D. Class II flame spread rating when used in fire rated corridor.
E. Adhesive recommended by laminate manufacturer, low VOC.

2.9 SCREWS

A. Self-drilling, countersunk head.
B. Galvanized or stainless steel in toilet and exterior areas.

2.10 NAILS

A. Finish or casing head nails.
B. Galvanized in toilet and exterior areas.
C. Siding and Soffit Nails: Ringshank hot-dipped galvanized stainless steel, or hardened aluminum.

2.11 ACCESSORIES

A. Connectors, edge trim moldings, adhesives, hardware, attachment anchors, closures, and trim shall be provided as indicated on DRAWINGS and as necessary for a complete finished appearance.
B. Interlocking metal or wood cleats in accord with AWI for panel installation.

C. Adhesives: recommended by manufacturer for condition of use.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine DRAWINGS and field conditions to receive the finish carpentry and architectural woodwork for defects that will adversely affect the work, and for deviations beyond allowable tolerances.
B. Do not expose or install interior finish woodwork until wet work such as gypsum board taping, masonry, concrete curing and plastering are complete.
C. Start of work shall mean acceptance of interfacing surfaces as capable of producing an acceptable job.

3.2 GENERAL FABRICATION

A. Construction per AWI “Custom Grade” unless specifically detailed otherwise. Install Bullet Shielding anchorage, joints and spaces in accord with manufacturers’ instructions. Install where indicated on DRAWINGS.
B. Finish shall be as specified under Section 09 91 00 - Painting.

3.3 GENERAL INSTALLATION

A. Completed work shall be plumb, level and square or to alignment indicated. Follow AWI and product manufacturer’s instructions.
B. Coordinate and allow for work of other trades as necessary.
C. Length of Exposed Wood Trim: Use longest lengths practical but not less than twelve feet.
D. Exposed edges: Ease to 1/8-inch radius unless larger radii are detailed.
E. Attachment:

    1. Secure all members with sufficient fasteners, anchors into adequate backing, or adhesives to insure rigidity and permanence.
    2. Use concealed fasteners whenever possible.
    3. Where necessary to fasten through exposed surfaces countersink fasteners, and fill holes flush with matching wood filler.
    4. Minimum Fastener Penetration: 1-1/4 inches or full penetration into solid backing.

5. Concealed attachment for rigid, permanent installation with screws into structural backing.
6. Use interlocking metal or wood cleats in accord with AWI to allow humidity movement for panel installation.

F. Joints:
   1. Use largest pieces practical.
   2. Tightly fitted, uniform and formed to conceal shrinkage.
   3. Running Trim:
      a. Miter corners.
      b. Join running trim with 45-degree bevel and only over solid backing.
      c. Stagger joints in adjacent pieces.
      d. Install scribed filler strips and seal to fill space between woodwork and adjacent construction.

G. Distribute allowable defects for best overall appearance.
H. Completed work free from hammer and other tool marks.
I. Verify dimensions of woodwork locations in building to insure proper fit.
J. Install hardware in accordance with manufacturer's instructions.

3.4 PLASTIC LAMINATE AND WOOD VENEER INSTALLATION

A. Fabricate over particleboard or medium density fiberboard in accordance with AWI and manufacturer instructions: No "L" shaped panels.
B. Adhere with adhesive over entire surface in accordance with laminate manufacturer's instructions.
C. Make joints and corners hairline and flush.
D. Apply laminate balance backing on reverse side of laminate finish sheet surfaces.
E. Install wall panels on two-piece metal clips to allow expansion and contraction.

3.5 PLYWOOD PANEL INSTALLATION (INTERIOR)

A. Installation shall be plumb, level or to alignment indicated on the DRAWINGS and per manufacturer's written instructions. Install panels in as large a piece as possible with horizontal joints (if any) at 8 feet minimum spacing, starting panels at floor.
B. Start panel layout at center of each wall to be paneled and install panels

symmetrically centered on space.

C. All vertical joints between plywood panels shall be butted with eased edges. Lay out vertical joints symmetrically.

    1. Horizontal joints and corners shall have aluminum or galvanized moldings in accordance with the DRAWINGS.

D. Provide a 1/8-inch space between panels at all horizontal and vertical joints.
E. Fasten with 8d galvanized casing nails at six inch on center at panel edges and ten inch on center at intermediate supports. Set nail heads flush with panel surface.

3.6 CABINET AND COUNTERTOP INSTALLATION

A. In accord with AWI “Custom Grade” and as specified in Section 06 41 16 - Laminate Faced Cabinets.

3.7 TOLERANCES NON-CUMULATIVE AND EVENLY DISTRIBUTED:

A. Woodwork:

    1. Width, height, and depth: plus or minus 1/8 inch.
    2. Square and plumb: 2 degrees.
    3. Scribe to fit surrounding construction: 1/8-inch maximum gap.
    4. Paneling:
    5. Flatness (twist cup or bow) of individual panel: 1/8 inch in four feet as measured with 4-foot straight edge.
    6. No hammer marks, chips or surface blemishes.

3.8 CLEAN UP

A. Leave panels, panel trim, woodwork and adjacent building areas clean and free from debris, excess sealant, adhesive and other soil caused by the installation of this Section work.

END OF SECTION

SECTION 06 41 16
LAMINATE FACED CABINETS

PART 1 - GENERAL

1.1 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Anchorage and backing components built into walls.

1.2 RELATED SECTIONS

A. Section 06 20 10 - Finish Carpentry and Architectural Woodwork
B. Section 07 92 00 - Joint Sealants
C. Section 09 21 16 - Gypsum Board Assemblies
D. Section 09 91 00 - Painting
E. Division 22 - Plumbing Fixtures and Trim.

1.3 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this Specification. The publications may be referred in the text by basic designation only. In case of conflict the most stringent shall govern:

1. ASTM C501 – Test Method for Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser.
2. ASTM C1048 – Specification for Heat-Treated Flat Glass – Kind HS, Kind FT Coated and Uncoated Glass.
3. ASTM D543 - Test Method for Resistance of Plastics to Chemical Reagents.
4. ASTM D570 - Test Method for Water Absorption of Plastics.
5. ASTM D695 - Test Method for Compressive Properties of Rigid Plastics.
6. ASTM D785 - Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials.
7. ASTM D790 - Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
8. ASTM D1037 - Method for Evaluating the Properties of Wood-Base Fiber and Particle Panel Materials.
9. ASTM D2583 – Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.

10. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
11. Architectural Woodwork Institute (AWI) - Architectural Woodwork Standards.
12. AWI - Architectural Casework Details.
13. U.S. Department of Commerce - American Lumber Standard PS 20.
14. U.S. Department of Commerce - Product Standard for Plywood PS 1.
15. U.S. Department of Commerce - Commercial Standard (CS) - Hardboard CS 251.
16. American National Standards Institute (ANSI) A 135.5 – Standard for Hardboard.
17. ANSI A156.9 – Standard for Cabinet Hardware
18. American National Standards Institute (ANSI) 208.1 - Particleboard.
19. ANSI A208.2 - Medium Density Fiberboard.
20. National Electrical Manufacturer's Association (NEMA) publications for general purpose, Vertical Surfacing, and Post Forming Grade High Pressure Decorative Plastic Laminates (HPDC).
21. Composite Panel Association (CPA).

1.4 CABINET DEFINITIONS

A. The term "cabinet" includes casework, shelves, and countertops with finished exposed edges and minimum 4-inch back and end splashes.
B. "Exposed" means surfaces visible when:

1. Drawer fronts and doors are closed.
2. Cabinets and shelving are open type or behind glass doors.
3. Bottoms of cabinets are seen: 48 inches or more above finished floors.
4. Tops of cabinets are seen: below 72 inches above finish floor, or are visible from an upper floor or stair.
5. Portions of cabinets visible after fixed appliances are installed.
6. Front edges of cabinet body members seen through a gap greater than 1/8 inch with doors and drawers closed.

C. "Semi-exposed" means those surfaces visible when:

1. Doors or drawers are open.
2. Bottoms of cabinets are between 30 and 48 inch above finish floor.
3. Front edges of shelving behind doors.

D. "Concealed" means surfaces visible when:

1. Not visible after installation.
2. Bottoms of cabinets less than 30-inches above floor.
3. Tops of cabinets 72 inches or more above finish floor and not visible from upper level.

E. Any item not detailed or specified shall be “Custom Grade” in accordance with AWI Standards, Section 10.

1.5 SUBMITTALS

A. Finished samples of items proposed including:

1. Typical cabinet case, door and drawer section.
2. Hinge, pull, drawer slide, shelf bracket.
3. Section of each type of countertop and backsplash.
4. Plastic laminate colors and textures.
5. Plastic polymer countertop.

B. Accepted samples will establish minimum standard of quality for the work.
C. Manufacturer’s Literature and Shop Drawings: Including elevations, sections, dimensions, materials, finishes, fasteners, hardware, anchorage, construction joint details and typical details. Indicate interface with adjacent materials.
D. Manufacturer’s Experience Record: Name, address, owner, and architect, phone numbers for comparative work.
E. Certification from casework manufacturer that products installed meet this specification.

1.6 PREINSTALLATION MEETING

A. When work is ready for cabinet installation arrange a meeting at the job with cabinet installer, CONTRACTOR, and CONTRACTING OFFICER.
B. Have approved product installation-applications recommendations available.
C. Give 5 workdays notice prior to meeting.

1.7 QUALITY ASSURANCE

A. Casework Fabricator: Company specializing in manufacturer of commercial and institutional cabinets, and casework with minimum of ten projects producing casework similar to that indicated.
B. Manufactured wood board products shall be tested and certified for reduced formaldehyde emissions under National Particleboard Association and the Hardwood Plywood Manufacturer’s quality control program.

1.8 STORAGE AND HANDLING

A. Store casework out of weather, dry and off ground.
B. Bring casework into building when building is enclosed and dry. Allow casework to acclimate at least 10 days before installing.

1.9 TEMPERATURE-HUMIDITY REQUIREMENTS

A. During and after installation of work of this Section, maintain same temperature and humidity conditions in building as will occur after occupancy.

PART 2 - PRODUCTS

2.1 CONSERVATION REQUIREMENTS

A. To the maximum extent possible provide materials with 20% minimum recycled content.
B. Provide mastics, adhesives and binders with low VOC emissions.

2.2 MATERIALS

A. Particleboard in accord with ANSI 208.1: Grade M, medium density 40 to 50 per cubic foot pound density with formaldehyde emission limit of 0.09 ppm and minimum 20% recycled wood, face screw holding of 225 pounds minimum: Roseburg Forest Products: 800-245-1115; Temple: 800-424-2311; Collins Pine: 800-547-1793
B. Medium Density Fiber Board (MDF)45 pounds per cubic foot in accord with ANSI A208.2: Grade 130 MR 30 made with formaldehyde emission limit of 0.11 ppm and 20% recycled wood, face screw holding of 220 pounds minimum: “Sierrapine”: 800-676-3339.
C. Hardboard: Tempered high-density 1/4 inch minimum thick per ANSI A 135 and A135.5.
D. Plastic Dividers: acrylic Plexiglas, smoke gray color tint - smooth polished edges: thickness indicated.
E. Plywood: A C grade per PS 1.
F. High Pressure Decorative Plastic Laminate (HPDL): NEMA general purpose or post forming grade.

1. Laminate backing may be NEMA BKL .020-inch (0.5 mm) grade or same as face.
2. Manufacturer's standard color finishes as specified.
3. Acceptable Manufacturers: Wilson Art, Nevamar, Abet Laminati, or Formica. Use only one manufacturer for entire job.
4. Adhesive recommended by laminate manufacturer for substrate and conditions of use.

G. Laminate-faced Panel Edges:

1. Semi exposed interior surfaces: 1mm ABS.
2. Cabinet box (s) doors, drawer fronts and backsplash: 3mm ABS.
3. Countertop exposed edges: 1mm ABS, or 3mm PVC.
4. 6mm Maple wood edges only as indicated in DRAWINGS and Section 09060 – Approved Colors and Textures.

H. Semi-Exposed interior surfaces: Factory thermally fused melamine (TFM), or polyester resin impregnated decorative overlay finish on MDF or particleboard in accordance with CPA; Plygard, Permalam or Panolam. Meet NEMA LD-3 except 125 cycle wear test.

I. Glazing in Glass doors: 1/8-inch thick fully tempered safety glass per ANSI Z97.1 AND ASTM C1048 roll marks horizontal.

1. Permanently label glass in accord with IBC 2403.

2.3 HARDWARE

A. Finish: U.S. 32D Stainless Steel, Satin finish or brushed chrome.

B. Hinges: All Steel ANSI 156.9, Grade 2 - B01602 or AWI type "E" European Style set in plastic inserts, concealed with door closed. Independent screw adjustment for depth, side, and height of door. 120 [170] degree opening, self-closing from 2 inch out. Grass 3000, Blum 95 M or equivalent Hafele. Provide two hinges for doors to 30 inches high, 3 hinges for doors over 30 inches.

C. Pulls: 1/4-inch bar pull 3-½ by 1inch; Hafele, Quality or Stanley.

D. Adjustable Shelf Supports: Minimum ANSI 156.9 - B04013 5mm diameter by 1/2 inch galvanized or chrome plated steel support pin into predrilled holes at 1 inch on center. Halefe: 282.27.401 or equal.

E. Drawer Slides: Full extension side or bottom mount steel with steel or polyethylene ball bearing rollers, with self-closing from four-inch extension, positive stop with lever latch to remove drawer; Grass, K & V, Blum, Accuride, or equal.

1. Slide manufacturer rated for 100-pound load at full extension in drawer width indicated and for up to 6-inch-high drawers.
2. Slide manufacturer rated for 200-pound load at full extension for drawers over 6 inches high.

F. Provide File drawers with steel Pandex file rails.
G. Drawer and Door Locks: 6-pin tumbler lock for mount to material up to 7/8 inch thick 3/4 inch minimum bolt travel: Schlage CL-Series or equal. Furnish 2 keys, Satin Chrome finish, each lock. Bored hole cam lock, key removable in locked and unlocked position: ANSI/BHMA, A156.11, EO 7271. Provide 2 keys.
H. Wire management Grommets: 2 inch inside diameter plastic.
I. Counter Top Trash Grommets: 8-inch inside diameter polished steel: www.mockett.com or equal.
J. Coat Rod and Shelf supports: 12 inch on center and end walls K & V, Stanley or approved.
K. Removable Vertical Panel Attach Clips: 1/4 inch aluminum 4 inch long two piece interlocking assembly.

1. Attach each clip with two #10 pan head screws.
2. Maximum lift-off distance: one inch.
3. Brooklyn Hardware: www.panelclip.com ; or equal.

2.4 INSTALLATION ACCESSORIES

A. Provide fasteners, angle anchors and adapters for rigid anchorage of casework onto surrounding structure. Use threaded anchors through gyp board into solid backing. Use drilled expansion anchors into concrete and masonry and into floors.

1. Provide stud wall backing of solid lumber or 16 gauge by 6-inch sheet steel with 2 screws into each stud across at least 3 studs.

2.5 COLOR - FINISHES

A. Exposed and semi-exposed surfaces shall be finished by the cabinet fabricator.
B. Vertical Exterior Surfaces: High-pressure decorative laminate (HPDL) of one manufacturer throughout job.
C. One of HPDL manufacturer’s standard wood grain matte finishes shall be

selected for vertical exposed surfaces.

D. Backers, shelves, drawer interiors and similar semi-exposed areas shall be the same beige, or off-white color.

2.6 SOLID SURFACE POLYMER COUNTERTOPS

A. Acrylic resin composite smooth surface polymer sheet of homogeneous through color matt gloss finish. One color will be selected from complete line of manufacturer's colors.

B. Edges: rounded 1/8 to 3/8-inch radius, ½ inch minimum countertop thickness, 1/2 inch minimum backsplash thickness. 4 – inch high backsplash.

   1. Provide 1/2 inch minimum particle board backer under countertops.

C. Water absorption: 0.08 percent maximum after 24 hours per ASTM D570.

D. Indentation: hardness 45 to 60 per ASTM D2583.

E. Abrasion Resistance: 1000 cycles: 0.9 grams maximum per ASTM C501.

F. Impact Resistance: ½ pound: no fracture per NEMA LD3.

G. Joint and Laminating bonding adhesive: as recommended by Solid Surface sheet manufacturer.

H. Acceptable Manufacturers:

   1. Dupont, "Corian": www.dupont.com
   2. Aristec, "Avonite" https://aristechsurfaces.com
   3. Samsung,"Staron": www.staron.com
   4. L.G. Hausys, "Hi-Macs": www.himacs.com

2.7 CASEWORK - FABRICATION

A. Fabricate to AWI "Custom Grade" with exposed surfaces clad with high-pressure decorative plastic laminate (HPDL). Shop assemble for delivery to site in easily handled units, which fit through building openings. Provide backing and wireways for plumbing and electrical attachments.

B. Conform to AWI "Reveal Overlay" or "Flush Overlay" design construction details.

C. Exposed Surfaces: Surface with NEMA general purpose or post forming grade HPDL.

   1. Countertops and backsplashes: 0.048-inch (1.0 mm) HPDL.

2. Door, drawer, and cabinet outside vertical faces: 0.028-inch (0.7mm) inch minimum thick HPDL.
3. Apply laminate without seams to 8-foot. Fit corners and joints hairline and flush.
4. Apply laminate balance sheet to reverse side of laminated surfaces.

D. Semi-Exposed Surfaces: Surfaced with HPDL, Thermal fused polyester or Melamine Overlay; inside cabinets, drawers and doors.
E. Door, Drawer and Shelf Edges: Applied with hot melt or PVA adhesive and bevel trimmed.
F. Doors and Drawer Fronts: 3/4 inch particleboard or MDF core with HPDL back balance sheet. Attach drawer fronts by glued dowels, glued dovetails, glued lock shoulder or screws with glue.
G. Countertops, Cabinet Tops and Bottoms: 3/4 inch particleboard or MDF core.
H. Shelves: 3/4 inch particleboard or MDF core for shelves up to thirty-five inch span, one inch particleboard or MDF over thirty-five inch span.
I. Unless greater number shown, provide one adjustable shelf in base cabinets and two adjustable shelves in upper cabinets.
J. Drawers: particleboard or MDF core with thermoset decorative overlay:

1. Back: 3/4 inch.
2. Sides: 1/2 inch thick.
3. Bottom: 1/4 inch thick. Set-in captured 4 sides or screw through bottom mount glides.

K. Wall Cabinet Attach Strips: Minimum 3/4 by 6-inch particleboard or MDF backer - full cabinet width.
L. Provide cutting or filler trim strips for tight fit to surrounding construction as necessary.

PART 3 - EXECUTION

3.1 INSPECTION OF SURFACES

A. Examine spaces, surfaces, and DRAWING details to receive the work for defects that will adversely affect the completed work and for deviations beyond allowable tolerances.
B. Verify adequacy of backing and support framing.

C. Start of work shall mean acceptance of the interfacing surfaces as capable of producing an acceptable job.

3.2 CABINET INSTALLATION

A. Install cabinets and countertops plumb, level, and square or to alignment indicated in accordance with approved submittals the written recommendations of the manufacturer and AWI custom grade.
B. Verify dimensions of cabinet locations in building to insure proper fit.
C. Coordinate with interfacing and related trades as necessary. Provide cut outs required for plumbing, electrical and other inserts required.
D. Install scribe cut to fit filler strips or scribe cut countertops and cabinets to provide maximum 1/16-inch gap to surrounding building construction. Fill and touch up exposed site made holes and raw edges to match adjacent finish.
E. Secure members together and into building structure with sufficient fastener, anchors and Z or L-type clips into solid structural backing to ensure rigidity and turn over resistance.

    1. Anchor wall cabinets with minimum No. 8 screws top and bottom at 16-inch maximum spacing one-inch penetration into solid backing or wall studs.
    2. Anchor free standing cabinets into floor with minimum ¼ inch drilled in anchors at each corner.

F. Seal joints smooth and watertight between countertop and adjacent construction with silicone sealant.
G. Seal all exposed, unfinished particleboard and MDF, including equipment and sink cutout edges with clear lacquer or varnish. Fill and touch up to match adjacent finish site made holes and scratches.

3.3 SOLID SURFACE INSTALLATION

A. Provide substrate backer under any joints, and at 6-inch maximum spacing. Edge cantilever: 4-inch maximum.
B. Reinforce edges with underlay.
C. Radius any cutouts: 1/2 inch.
D. Mount onto substrate backer with 1/2 inch dabs of non-staining silicone: 18 to 24 inches.

E. Install any field joints with bonding adhesives per Solid Surface manufacturer's recommendations. Finish joint flush and machine to match adjacent surfaces.
F. Separate tops containing hot appliances with 1/16 to 1/8 inch wide joint filled with non-staining silicone sealant.

3.4 TOLERANCES: NON-CUMULATIVE AND EVENLY DISTRIBUTED:

A. Width, Height and Depth: plus or minus 1/8 inch.
B. Gap between doors, drawers, panels and frames: 1/8 inch plus or minus 1/16 inch.
C. Square and Plumb: plus or minus 2 degrees.
D. Scribe fit to surrounding construction: 1/16 inch maximum.
E. Flatness of doors: 1/16-inch maximum warp measured diagonally for a 36-inch span.
F. Countertop: flush, tight exposed joints: 1/3 inch maximum.

3.5 ADJUSTING

A. Adjust doors, drawers, hardware and fixtures and other moving or operating parts to function smoothly and correctly.

3.6 CLEAN UP

A. Leave cabinets and surrounding areas clean and free from cartons, surplus materials, damage and soil caused by the cabinetwork installation.

END OF SECTION

SECTION 06 83 16
FIBER REINFORCED PLASTIC PANELING

PART 1 - GENERAL

1.1 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this Specification. The publications may be referred to in the text by basic designation only. In case of conflict only the most stringent shall apply.

1. ASTM C920 – Specification for Elastomeric Joint Sealants.
2. ASTM D256 - Test Method for Determining the Pendulum Impact Resistance of Notched Specimens of Plastics.
3. ASTM D543 - Test Method for Resistance of Plastics to Chemical Reagents.
4. ASTM D968 – Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive.
5. ASTM D570 - Test Method for Water Absorption of Plastics.
6. ASTM D2583 - Test Method for Indentation Hardness of Rigid Plastics by Means of Barcol Impressor.
7. ASTM D3841 - Specification for Glass Fiber-Reinforced Polyester Plastic Panels.
8. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
9. ANSI/ASTM E119 – Test Methods for Fire Tests of Building Construction and Materials.
10. Underwriters Laboratories (UL) Listing and Fire Resistance Directory.
11. International Building Code (IBC).

1.2 SUBMITTALS

A. Submit product data, colors, installation, maintenance for panels, fasteners, adhesives, edge trim, and dividers for approval.
B. Sample of panels and trims.

1.3 REGULATORY REQUIREMENTS

A. Conform to IBC 803 for fire retardant characteristics.

1.4 STORAGE AND HANDLING

A. Maintain panels and trim flat above ground protected from weather and moisture.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Maintain work area, substrate and materials 65 to 85 degrees F. 70 percent maximum relative humidity for 48 hours prior to, during and 48 hours minimum after installation.
B. Provide adequate ventilation.

PART 2 - PRODUCTS

2.1 FIBER REINFORCED PLASTIC COATED PANELS (FRP)

A. Fiberglass reinforced plastic resin wall and ceiling liner - facer panels per ASTM D3841.
B. Approved manufacturers subject to meeting specified criteria:

    1. Inpro G2 Bioblend wall protection; https://www.inprocorp.com/architectural-products/door-and-wall-protection/g2-bioblend/
    2. Crane “Composites” : www.cranecomposites.com

C. 0.090 inch thick by four feet by full length or minimum 10 feet.
D. Fire retardant characteristics:

    1. In exit corridors: U. L. class A, IBC class A maximum flame spread 25; maximum smoke developed 450 per ASTM E84.
    2. Within rooms: U. L. class C, IBC class C maximum flame spread 200; maximum smoke developed 450 per ASTM E84.

E. Hardness: 35 to 55 per ASTM D2583.
F. Abrasion Resistance: 0.01 percent maximum after 25 cycle Tabor Test, or after 50 litres falling sand per ASTM 968.
G. Water Absorption: 0.70 percent maximum in 24 hours per ASTM D570.
H. Color-Surface: Highly resistant to mild acids and alkalis per ASTM D543.

        a. Manufacturer's standard white, light beige, tan or gray with pebbled surface textures as approved.

b. Backside roughened for adhesive bond.

2.2 PANEL EDGE TRIM

A. Edges and Joints Trim: Shaped plastic inside corner, divider and edge “J” cap.
B. Outside corners: 18-gauge x 2 x 2-inch stainless steel or clear anodized aluminum.
C. Perimeter Trim: where panels transition to other wall finish: 18-gauge x 2-inch by edge thickness steel or clear anodized aluminum.
D. Stainless steel or aluminum screw trim fasteners.

2.3 PANEL FASTENERS AND ADHESIVES

A. Plastic or stainless steel blind rivets, or round head stainless steel screws. Moisture resistant adhesives as recommended in writing by the panel manufacturer for moist conditions of use.

2.4 PANEL SEALANT

A. Single component silicone in accordance with ASTM D920.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the DRAWING details and verify field conditions for defects that will adversely affect the work, and for deviations beyond allowable tolerances.
B. Work shall be substantially complete behind wall studs and above ceilings prior to start of work particularly, mechanical, electrical, insulation and vapor retarder.
C. Start of installation shall mean acceptance of the existing conditions as capable of producing an acceptable job.

3.2 FIBER REINFORCED PLASTIC PANEL INSTALLATION

A. Install in accord with manufacturer's written instructions and approved submittals for conditions of use, using uniform full bed of adhesive. Evenly space panels plumb and level in space available.

B. Set panel edges around penetrations into trim moldings with continuous bed of sealant. Allow thermal movement space between panels in accord with manufacturer's written instructions.
C. Evenly space and predrill fastener holes oversize 1/8 to 1/4 inch.
D. Secure moldings with approved screws evenly spaced at 12 inches maximum and 1 inch from ends maximum.
E. Secure panel field with straight, level evenly spaced rivets or screws as recommended by panel manufacturer not more than at 18 inches and with adhesive.

3.3 TOLERANCES (NON-CUMULATIVE)

A. Space around Mechanical, Electrical, and Other Penetrations: 1/4 to 1/2 inch before sealing.
B. Plumb and level: 1/8-inch in 10 feet.
C. Bowing or warping From Proper Plane: plus or minus 1/8 inch in ten feet.
D. Gaps between Perimeter Edge Trim Molding and Abutting Surfaces: 1/8 inch maximum with no abrupt changes.

3.4 CLEANING

A. Remove any excess visible adhesive or sealant using methods recommended by panel manufacturer.
B. After panel trim installations wipe Panel and trim surfaces with a damp rag to remove dust and dirt.
C. Leave Panels and adjacent surfaces in clean condition undamaged.

END OF SECTION

SECTION 07 18 13
PEDESTRIAN TRAFFIC COATINGS

PART 1 - GENERAL

1.1 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this Specification. The publications may be referred to in the text by basic designation only. In case of conflict only the most stringent shall apply. No Asbestos Based Products allowed.

1. International Building Code (IBC) 804.
2. ASTM D412 – Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
3. ASTM D522 – Test Methods for Mandrel Bend Test of Attached Organic Coatings.
4. ASTM D523 – Test Method for Specular Gloss.
5. ASTM D543 – Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents.
6. ASTM D2047 – Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces.
7. ASTM D2794 – Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
8. ASTM D3363 Test Method for film Hardness by Pencil Test.
9. ASTM D4060 – Test Method for Abrasion Resistance of Organic-Coatings by the Tabor Abraser.
10. ASTM D4258 – Practice for Surface Cleaning Concrete for Coating.
11. ASTM D4259 – Practice for Abrading Concrete.
12. ASTM D4541 – Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
13. ASTM F1869 – Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
14. ASTM F2170 – Test Method for Determining Relative Humidity in Concrete Floors Using insitu Probes.
15. ASTM F3010 – Practice for Two-Component Resin Based Membrane-Forming Moisture Mitigation for Use Under Resilient Floor Coverings.
16. ASTM G21 – Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

1.2 QUALIFICATIONS

A. Manufacturer shall have been making liquid applied floor coating with 5 years documented successful experience.
B. Installer shall have successfully completed at least 5 projects with similar materials within the past 5 years.

1.3 REGULATORY REQUIREMENTS

A. Conform to IBC 804 Class I interior floor finish: minimum 0.45 watts per square centimeter per NFPA Test Method 253.

1.4 REMOVAL AND REPLACEMENT OF LOOSE EQUIPMENT AND FURNITURE

A. OWNER will remove, relocate and replace existing furniture to allow flooring installation continuous underneath.

1.5 MOCKUP

A. Provide mockup of 10 square feet of flooring with wall base.
B. If accepted, mockup will demonstrate minimum standard for the Work. Mockup may remain as part of the Work.

1.6 SUBMITTALS

A. Product data for floor coating including substrate preparation, installation and temperature requirements.
B. Provide analysis and testing certification specified for the work in this Section.
C. Submit two 6 by 6 inch in size illustrating color and variation.
D. Submit cleaning and maintenance data. Include procedures for stain removal, and repairing surface.

1.7 INDOOR AIR QUALITY

A. The OWNER is concerned about indoor air quality, dust and chemical emissions.
B. Operate building permanent ventilation system at maximum outdoor airflow before mixing and applying flooring, and for minimum 72 hours after installation.
C. Enclose and collect floor prep scraping and grinding debris to prevent dust spreading into surrounding building.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Bring only enough products for each days work into building. Remove excess product from building at end of active work period.
B. Maintain minimum air temperature of 60 degrees F.
C. Keep products away from fire or open flame.

1.9 TEMPERATURE AND HUMIDITY REQUIREMENTS

A. Do not install flooring when floor temperature is below 55 degrees F or above 90 degrees F.
B. Maintain this temperature range, 24 hours before, during, and 72 hours after installation of flooring.
C. Maintain relative humidity at a minimum of 25 percent and a maximum of 50 percent along with adequate ventilation.
D. Provide uniform lighting of 50 foot candles in area of installation.
E. Restrict traffic from area where flooring is being installed or is curing.

1.10 WARRANTY

A. Provide 2-year warranty from Substantial Completion.
B. Warrant: floor coating remains smoothly attached to substrate continued resiliency, and freedom from cracks not caused by substrate movement.
C. Repair or replacement shall be at no cost to Owner.

PART 2 - PRODUCTS

2.1 LIQUID APPLIED SEAMLESS FLOOR COATING [HEAVY USE]

A. Elastomeric waterproofing and polyacrylate floor coating system recommended by its manufacturer for use on plywood floors and with 4 inch integral wall cove base.

    1. Fillers, primers, moisture suppressants, sealers: as recommended by flooring manufacturer for conditions of use.

        a. Single source responsibility: obtain all floor coating products from single manufacturer.

B. Acceptable manufactures subject to specified criteria:

    1. Dex-o-Tex “Dex-Flex”: waterproof deck system with base mortar, membrane, fabric reinforced membrane, protection coats and sealer. www.dexotex.com
    2. Equivalent systems by PPG Protective Coatings: www.ppgpmc.com; or Tennant Coatings Co: www.tennantco.com

C. Minimum System Thickness: 3/16 to 1/4-inch (3 to 5mm) dry.
D. Top Coat Properties:

    1. Weight: 2.5lbs per square foot
    2. Waterproofing: ASTM D751: No passage of water
    3. Weathering ASTM G23: Pass

4. Accelerated Aging: ASTM D756: No chalking, cracking or delamination
5. Water Absorption: ASTM D570: 6.09%
6. Fire Safety: Class A
7. Adhesion: ASTM D7234: >400 PSI

2.2 EDGE TRIM STRIPS

A. Provide at exposed edges of floor coating where no walls surround.
B. Formed aluminum, on one-piece width, same thickness as finish flooring, by two inch wide with tapered nose to accommodate different flooring thickness: PEMCO 173 or equal. At doorways, install under door.

    1. Provide counter sunk screw fasteners to match.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces and the DRAWINGS details to receive floor coating for defects that will adversely affect the work and for deviations beyond allowable tolerances.
B. Verify that subfloor is structurally sound in accord with flooring manufacturers recommendations.
C. Verify building permanent ventilation system is operating.
D. Start of work shall mean acceptance of interfacing surfaces as capable of producing acceptable work.

3.2 PREPARATION OF SURFACES

A. Prepare subfloor and wall base area in accord with floor coating manufacturer's recommendations: ASTM D4258, ASTM D4259 and these specifications.
B. Fill holes and cracks over 1/4 inch with floor coating manufacturer approved filler.

3.3 APPLICATION

A. Install coatings in accord with approved manufacturer's instructions, approved submittals, using floor coating manufacturer approved application materials including substrate temperature, primers, fillers, surface profile, number of coats, over-coating times anti slip granules.
B. Install completed floor coating with smooth full coverage without blisters or waves, with evenly applied abrasive slip resistant granules.

3.4 BASE INSTALLATION

A. Level with tight joints tightly adhered to vertical surfaces.

3.5 CLEAN UP

A. Remove surplus materials, adhesive and installation compounds from flooring and adjacent materials caused by flooring installation.
B. Leave completed flooring clean, ready for use.

3.6 PROTECTION

A. Prevent rolling traffic for at least 72 hours after installation.
B. Provide plywood under when moving heavy fixtures over flooring.

END OF SECTION

SECTION 07 21 10
BUILDING INSULATION

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Section 06 10 00 - Rough Carpentry
B. Section 06 12 00 – Structural Insulated Panels
C. Section 07 26 00 – Vapor Retarders
D. Section 07 63 10 –Flashing and Trim
E. Section 07 92 00 - Joint Sealants
F. Section 09 21 16 - Gypsum Board Assemblies
G. Division 22 – Plumbing Insulation
H. Division 23 – HVAC Insulation

1.2 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this Specification. The publications may be referenced in the text by basic designation only. In case of conflict the most stringent shall govern:

1. American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) “Handbook of Fundamentals”.
2. Underwriter’s Laboratories (UL) “Building Materials Directory”.

3. ASTM C165 – Test Method for Measuring Compressive Properties of Thermal Insulations.
4. ASTM C177 - Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties By Means of the Guarded- Hot Plate Apparatus.
5. ASTM C272 - Test for Water Absorption of Core Material for Structural Sandwich Construction.
6. ASTM C423 – Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
7. ASTM C518 - Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
8. ASTM C553 - Specification for Mineral Fiber Blanket Insulation for Commercial and Industrial Applications.
9. ASTM C578 - Specification for Rigid Cellular Polystyrene Thermal Insulation.
10. ASTM C612 - Specification for Mineral Fiber Block and Board Thermal Insulation.
11. ASTM C665 - Specification for Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
12. ASTM C764 – Specification for Mineral Fiber Loose- Fill Thermal Insulation.
13. ASTM C1104 – Test Method for Determining the Water Vapor Sorbtion of Unfaced Mineral Fiber Insulation.
14. ASTM C1338- Test Method for Deforming Fungi Resistance of Insulation Materials and Facings.
15. ASTM E84 - Tests for Surface Burning Characteristics of Building Materials.
16. ASTM E96 – Test Methods for Water Vapor Transmission of Materials.
17. ASTM E119 - Fire Tests of Building Construction and Materials.
18. ASTM E136 – Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C.

19. ASTM 1621 – Test Method for Compressive Properties of Rigid Cellular Plastics.
20. National Fire Protection Association (NFPA) 285 – Standard Method of Test for Evaluation of Flammability Characteristics of Exterior Non-load – Bearing wall Assemblies Containing Combustible Components.

1.3 SUBMITTALS

A. Manufacturer's literature including material, composition, fire hazard ratings, and application instructions.

1.4 PRODUCT LABELING

A. Insulation, or factory sealed packages of the insulation shall be marked by the insulation manufacturers as having the thermal resistance, fire hazard characteristics, water absorption, and compressive strength specified.

1.5 PROTECTION

A. Store and protect insulation from moisture until permanently enclosed.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Do not heat building until vapor retarders are completely installed.
B. Do not apply insulation to surfaces, which are frosty, damp or dirty.

PART 2 - PRODUCTS

2.1 PERFORMANCE CRITERIA

A. Thermal Resistance Values R:

1. Fill spaces as shown on DRAWINGS and provide minimum "R" indicated.
2. Indicated "R" shall be for the insulation material by itself per ASHRAE.

B. Fire Hazard Classification: Insulation materials, including integral facing covers and vapor retarders, shall meet the following ratings when tested in accordance with ASTM E-84 (tunnel test). Not required for rigid insulation installed under concrete or earth.

   1. Fuel contributed: 50
   2. Maximum installed flame spread: 25
   3. Maximum smoke developed: 450 (50 for insulation left exposed).
   4. Self-extinguishing.

C. No added asbestos.
D. No added formaldehyde.
E. Blanket fibrous glass insulation: Green Guard Certified.

2.2 BLANKET (BATT) INSULATION

A. Unfaced fibrous blanket of mineral wool or fibrous glass per ASTM C553 or C665 suitable for friction fit between framing or furring members.

2.3 ACOUSTICAL BATT INSULATION

A. Kraft paper facing attachment flanges on blanket of mineral wool or fibrous glass per ASTM C553 or ASTM C665: Minimum 2-1/2 inch thick.

2.4 SPRAY FOAM INSULATION

A. Spray Applied Polyurethane Insulation
B. 1.5 to 3 pounds minimum density. Low rising, low pressure semi-rigid where used around window rough openings.
C. Apply in accordance with manufacturers written instructions.

D. Cover any foam exposed to the interior of the building with gypsum board, sheet metal, of IBC approved thermal barrier coating.

2.5 SILL SEALER

A. 1/4-inch x 3-inch minimum by continuous roll resilient compressible closed cell polyethylene.
B. Dow “Ethafoam”, or Protecto Wrap.
C. Substitutions per Section 01 60 00 - Product Requirements.

2.6 STRUCTURAL INSULATED PANELS (SIPS)

A. Refer to Section 06 12 00 Structural Insulated Panels

2.7 ACCESSORIES

A. As necessary to permanently secure insulation in place: Galvanized wire, screws, plastic washers, adhesive adhered stick-impaling pins, with press-on clips, tapes, adhesives and sealants recommended by insulation manufacturers for specified use.

    1. Tape:

        a. 2 3/8 inch wide acrylic based pressure sensitive adhesive tape with polypropylene film, recommended by manufacturer for construction sealing against air and moisture: 3 mil minimum thick.
        b. Owens Corning “Bild-R-Tape” or equal.

    2. Vapor retarder fluid applied membrane: Prosoco “R-Guard” or equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine DRAWINGS and verify field conditions to receive insulation for defects that will adversely affect the completed installation, and for deviation beyond allowable tolerances.
B. Installation shall be done only after other trade work in the area is sufficiently complete to prevent subsequent disturbance of insulation.
C. Beginning of installation shall mean acceptance of the interfacing surfaces as capable of producing an acceptable job.

3.2 PREPARATION

A. Verify substrates are clean and dry. Remove loose or foreign matter.

3.3 INSTALLATION

A. Install in accordance with approved submittals and manufacturers written instructions using necessary primers and accessories.
B. Install continuously where indicated without voids. Fill spaces completely. Trim and fit closely around structure, door rough openings and frames, conduit, piping, obstructions and penetrations in accord with manufacturer's written instructions. Install clearance baffles around heat producing lights and heat producing appliances in accord with appliance manufacturer's instructions.
C. Coordinate to ensure separate vapor retarders are installed immediately after insulation to avoid moisture build-up.
D. Attach with sufficient tape, adhesives, or mechanical fasteners to permanently anchor insulation. Space stick pins where used at 16 inch maximum. Secure batt insulation between unfaced studs or joists with crosswires at 12 inches.

E. Install any integral membrane vapor barrier facing on warm side. Adhere with adhesive and seal facing continuously with overlapping tape at joints and penetrations and over any stick pins.
F. Where pipe or conduit is located in space to be insulated, place portion of insulation batt between pipe or conduit and building exterior. Compress insulation only slightly to keep in place.
G. Batt Insulation and Acoustical Batt Insulation:

1. Friction fit unfaced batts between rough openings and doors and windows and voids, using fasteners as necessary for permanent, snug installation without sagging or excess compression.
2. Install baffles at eave edges to hold attic insulation in place and prevent blockage of eave ventilation openings as detailed on DRAWINGS.

3.4 INSULATION SCHEDULE

A. Install insulation as specified in the following locations and other areas as specifically detailed on DRAWINGS.
B. Type I Unfaced Batt Insulation.

1. Roof trusses in cold roof: R50 Minimum

C. Sill Sealer:

1. Between bottom plate and floor of stud walls.

D. Unfaced Batt Insulation:

1. Between rough openings and cavities around doors and windows.
2. Fill inside hollow steel frames and voids around windows and mechanical/electrical penetrations of exterior walls.

E. Spray Foam Insulation:

1. Apply to gaps up to 1-inch between exterior doors, window and mechanical or electrical rough openings in accord with foam manufacturer's recommendations.
2. Fill exterior hollow doorframes before frame installation.
3. 6-inch minimum cover on inside face of perimeter glulam beams as indicated on DRAWINGS.
4. Fill gaps over one inch with unfaced batt insulation.

F. Acoustical Sound BATT Insulation:

1. All Interior Stud Walls.
2. Fill Hollow Doorframes in interior walls.

END OF SECTION

SECTION 07 26 00
VAPOR RETARDERS

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Section 07 21 10 - Building Insulation
B. Section 07 27 10 - Air and Water Barriers
C. Section 07 92 00 - Joint Sealants
D. Section 09 21 16 - Gypsum Board Assemblies

1.2 APPLICABLE PUBLICATIONS

A. The publications listed form a part of this Specification. The publications are referred to in the text by basic designation only. In case of conflict the most stringent shall apply.

1. ASTM C1136 - Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
2. ASTM D412 – Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
3. ASTM D751 - Test Methods for Coated Fabrics.
4. ASTM D882 -Test Methods for Tensile Properties of Thin Plastic Sheeting.
5. ASTM D903 – Test Method for Peel or Stripping Strength of Adhesive Bonds.
6. ASTM D 1004 - Test Method for Initial Tear Resistance of Plastic Film and Sheeting.
7. ASTM D1709 Test Methods for Impact Resistance of Plastic Film by Free-Falling Dart Method.
8. ASTM D1790 - Test Method for Brittleness Temperature of Plastic Sheeting by Impact.
9. ASTM D1876 -Test Method for Peel Resistance of Adhesives (T-Peel Test.)
10. ASTM D1970 – Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials used in Steel Roofing Underlayment for Ice Dam Protection.
11. ASTM D2103 - Specification for Polyethylene Film and Sheeting.
12. ASTM D2582 - Test Method for Puncture-Propagation Tear Resistance of Plastic Film and Thin Sheeting.
13. ASTM D4533 – Test Method for Trapezoid Tearing of Geotextiles.

14. ASTM D4397-Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications.
15. ASTM D7003 -Test Method for Strip Tensile Properties of reinforced Geo membranes.
16. ASTM D7004 - Test Method for Grab Tensile Properties of reinforced Geo membranes.
17. ASTM E84 -Test Method for Surface Burning Characteristics of Building Materials.
18. ASTM E96 -Test Methods for Water Vapor Transmission of Materials.
19. ASTM E154-Test Methods for Water Vapor Retarders used in contact with earth under concrete slabs, on walls, or as ground cover.
20. ASTM E 1643 - Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete.
21. ASTM E-1745 - Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
22. ASTM E2357 Test Method for Determining Air Leakage of Air Barrier Assemblies.
23. ASTM F1249 Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.

1.3 SUBMITTALS

A. Manufacturer's literature including material, composition, fire hazard ratings, and application instructions. Provide proposed penetration, lap, and edge sealing methods.

1.4 ENVIRONMENTAL REQUIREMENTS

A. Do not heat building with permanent insulation installed until vapor retarders are completely installed.

PART 2 - PRODUCTS

2.1 CEILING SHEET VAPOR RETARDER:

A. Sheet polyethylene plastic, minimum thickness 6 mill.
B. Permanently Exposed or within building HVAC cavity-plenum: in addition to requirements of A, above: Aluminum foil or plastic faced for maximum installed flame spread of 25, and maximum smoke developed of 50, per ASTM E84 or U.L. Fire Hazard Classification Test (U.L. 723).
C. Water Vapor Transmittance: 0.05 perm maximum per ASTM E96 method.

D. Minimum tensile strength: 30 pound per inch width per ASTM C1136 or ASTM D882.
E. Width: 8-foot minimum by continuous roll length.

2.2 ACCESSORIES

A. Primers, adhesives, sealants, solvents, battens, staples, clips, stick pins, reglets, trim, and other accessories recommended by vapor retarder manufacturer and necessary for a complete installation.

2.3 TAPE

A. Width: 2-inch minimum.
B. Polyethylene or polypropylene tape, with water resistant self adhesive recommended by the vapor retarder membrane manufacturer for cold temperature application to polyethylene sheet and steel; minimum adhesive strength 25 ounces per inch width.
C. Use tape specifically recommended by vapor retarder manufacturer:

    1. Owens Corning “Bild-R-Tape”.
    2. Proscoco “R-Guard” fluid applied membrane or equal.

2.4 ADHESIVE

A. Spray-on 3M Inc. “High tack adhesive 76” or equivalent recommended for adhesion to polyethylene.

2.5 SEALANT

A. Single component Polyurethane or non-hardening synthetic rubber acoustical type per Section 07 92 00 - Joint Sealants.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Drawing Details and field conditions to receive work for defects that will adversely affect the completed installation and for deviations beyond allowable tolerances.

B. Substrate surfaces shall be free of sharp projections or holes over which the vapor retarder sheet can easily be applied without tearing or puncturing.

   1. Insulation shall be complete per Section 07 21 10 – Building Insulation and be dry, free of frost or ice.

C. Verify that substrate work by other trades is complete and ready for vapor retarder.
D. Beginning of installation shall mean acceptance of the existing conditions as capable of producing an acceptable job.

3.2INSTALLATION

A. Completed installation shall be continuous, without gaps, holes or tears and in accord with vapor retarder manufacturer's recommendations on warmest side of insulation to minimize vapor flow into insulation from the interior.

   1. Coordinate with framing installer to install separate sheets of vapor retarder through and around framing members for subsequent lap and seal.

B. Joints:

   1. Lap wall vapor retarder 4 inches minimum, staple or tape to supports or roll seams and staple together. Seal over seams continuously with tape.
   2. Lap floor above-grade vapor retarder 6-inches and seal with tape.

C. Edges: Seal edges with tape or adhesive onto firm continuous bearing: as at structural steel.
D. Layout vapor retarders to provide a single continuous sheet where possible with a minimum number of joints. Allow enough slack or pleats so that finish material installation does not tear vapor retarder.
E. Penetrations: Seal vapor retarder continuously around all structural, mechanical, electrical and other penetrations with tape and sealant in accord with vapor retarder recommendations. Wrap tape two times around penetration. Run separate sheet of wall vapor retarder behind electrical boxes or seal edges around electrical boxes with polyurethane sealant.
F. Attachment: Tape and adhesives or fasteners. Seal holes caused by fasteners with tape.
G. Extend wall vapor into openings and similar, for trimming after finishes are applied. Seal with sealant to opening frames.
H. Lap wall vapor retarders onto roofing areas and apply in sealant bed and tape.

3.3VAPOR RETARDER SCHEDULE

A. Install vapor retarder on inside of ceiling-roofs scheduled for batt insulation, and additionally as indicated on DRAWINGS.

END OF SECTION

SECTION 07 27 10
AIR AND WATER BARRIERS

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Section 06 12 00 – Structural Insulated Panels
B. Section 07 21 10 - Building Insulation
C. Section 07 92 00 - Joint Sealants
D. Section 09 21 16 - Gypsum Board Assemblies

1.2 APPLICABLE PUBLICATIONS

A. The publications listed form a part of this Specification. The publications are referred to in the text by basic designation only. In case of conflict the most stringent shall apply.

1. ASTM C920 – Specification for Elastomeric Joint Sealants
2. American Society for Testing and Materials (ASTM) ASTM D828 - Test Method for Tensile Properties of Paper and Paperboard Using Constant-Rate-of-Elongation Apparatus.
3. ASTMD828 – Test Method for Tensile Properties of Paper and Paperboard.
4. ASTM D882 - Test Method for Tensile Properties of Thin Plastic Sheeting.
5. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
6. ASTM E96 - Test Methods for Water Vapor Transmission of Materials.
7. ASTM E283 – Test Method for Water Penetration and Air Leakage Through Exterior Windows, Curtain Walls and Doors Underspecified Pressure Differences Across the Specimen.
8. ASTM E331 – Test Method for Water Penetration of Exterior Windows, Sky lights, Doors and Curtain Walls by Uniform Static Air Pressure Difference.
9. ASTM E1677 – Specification for Air Retarder Material or System for Low-Rise Framed Building Walls.
10. ASTM E2178 – Test Method for Air Permeance of Building Materials.
11. International Building Code (IBC) Chapter 14.
12. National Fire Protection Association (NFPA) 285 Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Non-load-bearing Wall Assemblies Containing Combustible Components.

1.3 SUBMITTALS

A. Manufacturer's literature including material, composition, vapor transmission, water resistance, fire hazard ratings, and application instructions, including penetration, lap and edge details.

1.4 ENVIRONMENTAL REQUIREMENTS

A. Do not heat building with air barrier in place until insulation and vapor retarders are completely installed inside.

PART 2 - PRODUCTS

2.1 SHEET AIR AND WATER BARRIER

A. Moisture vapor permeable, five-foot minimum width in continuous sheet recommended by manufacturer to resist air and liquid water infiltration through exterior walls while allowing moisture vapor to escape.

1. Air penetration: .06 cubic feet per minute per square foot maximum at 0.3 H_2O/75 Pa per ASTM E-1677, ASTM E-283 or ASTM E2178.
2. Water resistance: no water penetration when tested for 15 minutes at 15 miles per hour per ASTM E1677, or ASTM E331.
3. Water drainage: vertical grooves or wrinkle textured surface to allow water drainage.
4. Moisture vapor transmission rate: more than 25 perms per ASTM E-96.
5. Tensile Strength: 25 pounds per inch minimum per ASTM D-882 or ASTM D828.
6. Flame spread: Class A 25 maximum per ASTM E-84.
7. Smoke development: Class A 450 density maximum per ASTM E-84.
8. NFPA 285 Flammability test compliant with polyiso or mineral wool insulation.

B. Acceptable Manufacturers subject to meeting specified requirements:

1. VaproShield "Wall Shield" or "Wrapshield"– www.vaproshield.com
2. Or approved equal

2.2 ACCESSORIES

A. Attach and seal with primers, adhesives, mastics, tapes through wall flashing membrane, opening corners, sealants and fasteners as recommended by air barrier manufacturer and as follows:

1. Polyethylene or polypropylene tape, with water resistant pressure sensitive adhesive recommended for cold temperature application to plastic sheet and metal: Owens Corning.”Bild-R-Tape”; Proscoc “R-Guard” Mastic or approved.

B. Adhesive: recommended for cold temperature application to plastic and metal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Drawing Details and field conditions to receive work for defects that will adversely affect the completed installation and for deviations beyond allowable tolerances.
B. Substrate surfaces shall be free of sharp projections or holes over which the air barrier sheet can easily be applied without tearing or puncturing.
C. Verify that substrate work by other trades is complete and ready for air barrier.
D. Beginning of installation shall mean acceptance of the existing conditions as capable of producing an acceptable job.

3.2 INSTALLATION

A. Install sheet barrier horizontally. Completed installation shall be continuous without gaps, holes or tears in accord with air barrier manufacturer’s instructions for conditions of use and these specifications.
B. Layout air barrier to provide single sheet where possible with a minimum number of joints. Allow enough fullness or pleats at corners and offsets so that finish material installation does not tear air barrier.
C. Lap sheet air barrier joint seams four inches minimum, adhere, mechanically fasten or tape to backing and seal continuously with tape. Lap top layer over bottom to shed water. Lap air barrier over flashings to allow water to escape.
D. Penetrations: Seal air barrier continuously around all structural, mechanical, electrical and other penetrations with tape and sealant. Tape extra separate sheet of air barrier over as necessary.
E. Attachment: Tape, primer, adhesives, screws, staples as recommended by manufacturer. Seal holes caused by staples with tape.

F. Seal air barrier to door and window frames. Lap and tape air barrier over window and door header flashing to shed water. Underlay and tape air barrier under window sill flushing to shed water.
G. Lap air barriers onto membrane roofing and apply sealant bed.
H. Repair: All punctures and tears by patching with extra lapping material twelve inches minimum and sheet taping, just prior to final cover up.

3.3 AIR BARRIER SCHEDULE

A. Install barrier at exterior walls and additionally as indicated on DRAWINGS.

END OF SECTION

SECTION 07 41 14
METAL STANDING SEAM ROOF SYSTEM

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Section 06 10 00 – Rough Carpentry
B. Section 07 21 10 – Building Insulation
C. Section 07 42 13 - Metal Wall Panels
D. Section 07 63 10 - Flashing and Trim
E. Section 07 92 00 - Joint Sealants

1.2 APPLICABLE PUBLICATIONS

A. The publications listed form a part of this Specification. The publications are referred to in the text by basic designation only. In case of conflict the most stringent shall apply.

1. ASTM A653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
2. ASTM A792 - Specification for Steel Sheet, 55 percent Aluminum-Zinc Alloy-Coated by Hot-Dip Process.
3. ASTM A924 – Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
4. ASTM B117 - Practice for Operating Salt Spray (Fog) Apparatus.
5. ASTM C518 – Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
6. ASTM C578 – Specification for Rigid, Cellular Polystyrene Thermal Insulation.
7. ASTM D412 - Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension.
8. ASTM D523 – Test Method for Specular Gloss.
9. ASTM D714 - Test Method for Evaluating Degree of Blistering of Paints.
10. ASTM D737 – Test Method for Air Permeability of Textile Fabrics.
11. ASTM D822 – Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
12. ASTM D882 – Test Methods for Tensile Properties of Thin Plastic Sheeting.

13. ASTM D903 – Test Method for Peel or Stripping Strength of Adhesive Bonds.
14. ASTM D968 - Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive.
15. ASTM D1621 – Test Method for Compressive Properties of Rigid Cellular Plastics.
16. ASTM D1970 - Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials used As Steep Roofing Underlayment for Ice Dam Protection.
17. ASTM D2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
18. ASTM D2247 - Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.
19. ASTM D3363 - Test Method for Film Hardness by Pencil Test.
20. ASTM D4145 – Test Method for Coating Flexibility of Prepainted Sheet.
21. ASTM D4214 - Test Method for Evaluating Degree of Chalking of Exterior Paint Films.
22. ASTM D5034 – Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test).
23. ASTM E96- Test Methods for Water Vapor Transition of Materials.
24. ASTM E331 – Test Method for Water Penetrations of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
25. ASTM E1592 – Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.
26. ASTM E1646 – Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference.
27. ASTM E1677 – Specification for an Air Retarder (AR) Material or System for Low Rise Building Walls.
28. International Building Code (IBC), Chapter 16.
29. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) - Architectural Sheet Metal Manual.
30. American Architectural Manufacturing Association (AAMA) 621 – Voluntary Specifications for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized and Zinc-Aluminum Coated Steel Substrates.

1.3 PERFORMANCE REQUIREMENTS

A. Provide certification from a licensed civil engineer for roofing wind and snow loads in accord with IBC Chapter 16 for loads indicated on Structural Drawings.

1. Wind resistance in accord with ASTM E1592 from roof panel through attachment into structure or certify by licensed engineer. Use factor of safety of 3 for screws into steel, and 6 for screws into wood.
2. Wind Load: in accord with Structural Drawings.

3. Snow Load: Per structural DRAWINGS. Provide fix point drag resistance location with number and size of screws required.

B. Thermal Movement: Provide for expansion and contraction from fix location with surface temperatures between minus 30 degrees F. and plus 180 degrees F. without causing permanent buckling, cracking of finish, opening of joints, or failure of fasteners.
C. Water Penetration of Panel Joints: No leak at 12 psf when tested in accordance with ASTM E1646 or E331.

1.4 SUBMITTALS

A. Shop Drawings, Calculations and Product Data to Illustrate:

1. Conformance with Performance Requirements:
    a. Provision for expansion, contraction, at edges, and panel attachment clips.

2. Installation Layout and Details:
    a. Layout of Panels: Profile with dimensions.
    b. Vapor Retarder Data.
    c. Air-Water barrier Data.
    d. Insulation Data.
    e. Attachment clip spacing, locations number and size of screws.
    f. Details of edge flashing.
    g. Indicate fixed screw attach point for panels from which thermal movement occurs.
    h. Location of closure strips and sealant.
    i. Location and flashing details at penetrations.

3. Screw Fasteners:
    a. Type, corrosion resistance, size and spacing to be used for substrate condition with manufacturer’s pullout and shear rating to resist loads.
    b. Spacing and anchorage at eaves, ridges, rake, and central areas.
    c. Attachment of exposed perimeter flashing.

4. Joints:
    a. Inter-relationship of components and flashing.
    b. Sealant and Sealant tape specifications.

5. Coating Specifications.

B. Samples:

1. Submit 12-inch long, full width sample of roof panel, illustrating seam system.
2. 3 -inch square paint samples

C. Certificates:

1. Manufacturer's certification of conformance to Performance Requirements.
2. Installer qualifications and approval by manufacturer.

D. Warranties.

1.5 QUALITY ASSURANCE

A. Roofing Manufacturer Qualifications:

1. At least 25 successful jobs manufacturing concealed fastener standing seam metal roofing similar to that proposed.
2. Roofing manufacturer shall have recommended installation details including attachment, ridge, eave, edges and penetration flashing.
3. Roofing Manufacturer shall have installation training.

B. Installer Qualifications:

1. Minimum, 5 successful installations in Alaska with sheet metal roofing similar to that proposed.
2. Approved in writing by the roofing manufacturer.

C. Pre-Installation Conference:

1. Attended by CONTRACTOR, installer, manufacturer's representative, ARCHITECT, and OWNER'S REPRESENTATIVE.
2. Schedule in advance of start of work and when at least part of deck is ready for roofing.
3. Approved submittals and samples of roofing materials shall be available at conference.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Installation of Expansion Joints, Sealants, and Underlayment:

1. Temperature between 40 and 65 degrees F.
2. Surfaces free of rain, snow, or frost.

1.7 WARRANTIES

A. Manufacturer's 10-year warranty that panels, and panel manufacturer

provided flashing, that will not rupture, fail structurally, or perforate due to corrosion.

B. Paint Finish: Manufacturer's 10-year warranty covering color fade, chalking, peeling, cracking, or blistering.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to meeting specified criteria:

1. Ultra Seam, Inc. - www.ultraseam.com.
2. Metal Sales – www.metalsales.us.com.
3. AEP Span – www.aepspan.com

2.2 METAL ROOFING

A. Roofing Panels: Steel, standing seam concealed fastener installation, continuously factory roll formed conforming to Performance Requirements: similar to AEP Span "Span-Loc" or equivalent.

1. Minimum Thickness: 22-gauge before coating.
2. Width: 16 inches, maximum.
3. Length: Full length of roof, no end joints permitted.
4. Standing Ribs: Maximum 16 inches on center and 1-1/2 inches minimum height with intermediate small ribs.
5. Sheet steel: ASTM A792 Zincalume®, minimum yield 50,000 psi, Thickness 22 gauge / Pre-finished galvanized steel sheet 0.030 inch base metal thickness.
6. Attachment Clips: Galvanized or stainless steel with allowance for thermal movement.

B. Factory applied color coating:

1. Prime both sides; complete finish exposed exterior side via coil coat method.
2. Duranar KL Plus, Polyvinylidene fluoride, (PVDF) coating system with minimum 70 percent resins complying with AAMA 621. Silicone polyester allowed on interior surface.
3. Coating Thickness: minimum 1.9 mil: Primer 0.7 – 0.8 mil, Finish Coat 0.7 – 0.8 mil. and Top Clear Coat 0.45 – 0.55 mil.
4. Gloss: 8-15 at 60 degrees in accord with ASTM D523.

5. Weathering - no checking, blistering or adhesion loss when tested for 5,000 hours in accordance with ASTM D822.
6. Chalking - no chalk greater than No. 8 rating when tested for 2,000 hours in accordance with ASTM D4214.
7. Fading - color change shall not exceed 5 units when tested for 2,000 hours in accordance with ASTM D2244.
8. Salt Spray - no more than 1/16-inch creep or tape off from scribe and less than 5 percent No. 8 blisters when tested for 750 hours in 5 percent salt fog at 95 degrees F. in accordance with ASTM B117.
9. Flexibility - no rupture of coating when bent 180 degrees in accordance with ASTM D4145.
10. Hardness: HB - pencil hardness: no film failure when tested in accordance with ASTM D3363.
11. Abrasion Resistance: withstand 50 liters falling sand before appearance of base metal in accord with ASTM D968.
12. One of manufacturer's standard colors will be selected: Match for flashing and trim.

2.3 FLASHING, TRIM, AND ACCESSORIES:

A. Provide for perimeter edges and penetrations and as recommended by the roof manufacturer for complete weathertight installation per the Performance Requirements.
B. 22-gauge galvanized sheet steel accurately formed and in accordance metal roofing manufacturers and SMACNA recommended practices and approved submittals.
C. Rectangular Penetrations and Pipes over 6-inch diameter: Single piece welded watertight penetration flashing with ice deflector cricket, formed to fit roof profile.
D. Round Penetrations up to 6-inch diameter (Pipe Flashing): EPDM rubber “Dektite” “Sealtite” or “Master Flash” Type recommended by flashing manufacturer for metal roof pipe penetration flashing, centered in roofing panel with stainless steel clamp band.

    1. Over 6-inch diameter use flashing specified for rectangular panel.

E. 10 feet minimum flashing lengths.
F. Match finish and color of roofing.
G. Flashing Attachment Cleat-Clips: 20-gauge minimum, galvanized or Stainless steel.
H. Fabricate in accordance with Contract Documents and approved shop drawings.

2.4 FASTENERS

A. Screws recommended by the roof manufacturer but not smaller than Number 14 diameter stainless steel or carbon steel corrosion resistant coated to resist 1000 hours of salt spray per ASTM B117 with no more than 5 percent red rust appearing on head or shank. Screws shall completely penetrate materials to be joined.
B. Exposed Fasteners: for flashing trim and fixed point only: Number 14 diameter screws preassembled with a 3/4-inch diameter 18 gage tapered lip stainless steel washer bonded to an EPDM sealing washer. Factory paint heads and washers to match roofing finish.
C. Minimum pullout value 400 pounds when tested in predrilled pilot holes through 16 gage thick, ASTM A653 steel or 3/4 inch plywood.
D. Rivets or nails not permitted.

2.5 CLOSURE STRIPS

A. Closed cell laminated polyethylene resilient foam shaped to tightly fit panel profile.
B. 1-1/2 inch minimum width.

2.6 SELF-ADHERING ROOF UNDERLAYMENT

A. Pre-Manufactured, bitumen, self-adhering, self-sealing sheet membrane waterproofing composed of high-strength polyethylene bonded to rubberized asphalt per ASTM D1970 recommended by underlayment manufacturer and shingle manufacturer for application as roof underlayment meeting the following requirements.

    1. Total thickness: 40-mil minimum.
    2. Maximum load at break: 25 pounds per inch per ASTM D1970.
    3. Asphalt elongation at break asphalt: 10 percent minimum per ASTM D1970.
    4. Low Temperature Flexibility: 180-degree bend over 1-inch mandrel at minus 20 degree F without cracking per ASTM D1970.
    5. Overall adhesion to Plywood and to adjacent membrane at 40 degrees F: 3.0 pound per inch width minimum per ASTM D1970.
    6. Sealability around nail: pass per ASTM D1970.
    7. Removable treated release paper, no special cleaning to self-adhere entire sheet.

8. Primer: as required by underlayment manufacturer for conditions of use.

B. Acceptable Manufacturers: subject to specified criteria:

1. “Ice and Water Shield” by W.R. Grace: wwww.wrgrace.com
2. “Blueskin RF200” by Henry Company: http://henry.com/select/
3. Self-sealing underlayment manufactured by the approved shingle manufacturer.
4. Substitutions in accordance with General Conditions.

2.7 SEALANT

A. Single component urethane or silicone, meeting the requirements of ASTM C 920.
B. Color: Standard color nearest match to roofing.

2.8 TAPE SEALANT

A. Self adhesive in roll form with closed cell resilient foam core as recommended by roof manufacturer.
B. 3/8-inch minimum wide.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrate, DRAWING Details, and conditions under which roof will be installed.
B. Verify field measurements. Modify work as required for accurate fit.
C. Beginning installation shall mean acceptance of existing conditions as capable of producing an acceptable job.

3.2 UNDERLAYMENT INSTALLATION

A. Prime substrate as recommended by underlayment manufacturer.
B. Install continuous fully adhered over entire roof wrinkle free and with joints overlapping 6 inches minimum to shed water in accord with underlayment manufacturer’s instructions. Extend up all adjoining walls, beneath flashing, 8 inches minimum.

C. Extend up 6 inches minimum and seal around projecting items watertight with urethane sealant.
D. Do not leave exposed to weather more than 15 days after beginning of installation.

3.3 METAL ROOFING INSTALLATION

A. Install in accordance with approved shop drawings and manufacturer's written instructions to meet Performance Requirements. Walk on roof panels only with clean, soft-soled shoes.
B. Locate panel end clips 6 inches maximum from panel ends. Provide panel fixity with screws to resist snow down drag requirements.
C. Align panels and intermediate clips for ease of thermal movement. Maintain seams parallel to slope. Provide shims and spacers as necessary for panel to clip thermal movement without abrasion.
D. Provide additional panel clips at eaves and ridges, as required for wind resistance.
E. Install sidelap tape sealant at panel side lap. Install extra sealant over and under clips.
F. Secure panels without warp or deflection.
G. Turn up panel trays at top of slope.
H. Install closures at top and bottom of panels, and as indicated on the DRAWINGS set in continuous bead of sealant or sealant tape and with additional sealant between closure and roofing.
I. Center pipe penetrations in panel tray. Provide elongated hole to accommodate thermal movement.

3.4 FLASHINGS AND ACCESSORIES INSTALLATION

A. Conform to roof manufacturer recommendations SMACNA recommended practices and approved shop drawings for weathertight assembly with allowance for thermal movement. Extend in single piece 10 inches minimum above roof surface.
B. Flashing Intersecting Panel Ribs: Install resilient closure and sealant as needed for weathertight closure: one piece or welded watertight 6 inches above rib top.

C. Provide inside backed butt joints with thermal expansion space or lap flashing joints 4-inches in sealant tape or continuous sealant or lap flashing joints 4 inches in sealant tape or continuous sealant.
D. Fastener spacing at each roofing main rib, or 12-inches maximum and 2-inches maximum from edges and ends.
E. Provide thermal movement space around penetration spaces.
F. Seal round penetrations with rubber pipe flashing set in sealant and using sealing washers and screws.
G. Seal fixed flashing joints in lapped sealant bed or 1/4-inch round sealant bead in slot.
H. Seal moving flashing joints with sealant tape.
I. Seal under edges of perimeter flashing.

3.5 TOLERANCES

A. Alignment: 1/4 inch in 10 feet, maximum variation.

3.6 ADJUSTING AND CLEANING

A. Remove cuttings and metal shavings from finished surfaces at the end of each day. Remove stains immediately.

END OF SECTION

SECTION 07 42 13
METAL WALL PANELS

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Section 06 10 00 – Rough Carpentry
B. Section 07 27 10 - Air and Water Barriers
C. Section 07 41 14 - Metal Standing Seam Roof System
D. Section 07 62 10 – Flashing and Trim
E. Section 07 92 00 - Joint Sealants

1.2 APPLICABLE PUBLICATIONS

A. Applicable Publications: The publications listed below form a part of this Specification. The publications are referred to in the text by basic designation only. In case of conflict the most stringent shall apply.

1. ASTM A653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
2. ASTM A924 - Specification for General Requirements for Steel Sheet, Metallic Coated by the Hot-Dip Process.
3. ASTM A792 - Specification for Steel Sheet, 55 Aluminum-Zinc Alloy-Coated by the Hot Dip Process.
4. ASTM B117 - Practice for Operating Salt Spray (Fog) Apparatus.
5. ASTM C920 - Specification for Elastomeric Joint Sealants
6. ASTM D412 - Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension.
7. ASTM D523 – Test Method for Specular Gloss.
8. ASTM D714 - Method for Evaluating Degree of Blistering of Paints.
9. ASTM D822 – Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
10. ASTM D968 - Test Method for Abrasion Resistance of Organic Coatings by Falling Abrasive.
11. ASTM D1654 - Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.
12. ASTM D2244 - Test Method of Calculation of Color Differences from Instrumentally Measured Color Coordinates.

13. ASTM D2247 - Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.
14. ASTM D3363 - Test Method for Film Hardness by Pencil Test.
15. ASTM D4145 – Test Method for Coating Flexibility of Prepainted Sheet.
16. ASTM D4214 - Test Method for Evaluating Degree of Chalking of Exterior Paint Films.
17. ASTM E330 – Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
18. ASTM E331 – Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
19. SMACNA - Sheet Metal and Air Conditioning Contractors of America Architectural Sheet Metal Manual.
20. American Architectural Manufacturers Association (AAMA) 621 – Voluntary Specifications for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) and Zinc-Aluminum Coated Steel Substrates.

1.3 PERFORMANCE REQUIREMENTS

A. Wind Loads: size components to withstand inward and outward seismic and wind loads without causing detrimental effects to the wall panel system in accordance with the following as laboratory tested and measured in accordance with ANSI/ASTM E330:

   1. General IBC Chapter 16.
   2. Positive and negative (suction) Wind Forces: as indicated on Structural Drawings.

B. Water Penetration: No uncontrolled water penetration to inside of building when wall panel joints tested in accord with ASTM E331 at 10 psf and 5 gallons water per square foot for 15 minutes.

1.4 SUBMITTALS

A. Shop Drawings and Product Data to Illustrate:

   1. Installation Layout and Details:

      a. Layout and dimensions of panels: verify field dimensions.
      b. Details and spacing of anchors and furring.
      c. Details of flashing and metal closures.
      d. Location of closure strips and sealant.
      e. Location and flashing details at penetrations.
      f. Coating Finish Specifications.

   2. Fasteners:

a. Type, corrosion resistance spacing and size to be used for each condition.
b. Attachment of exposed perimeter flashing.
c. Manufacturer's rated withdrawal value for fasteners, into substrates indicated on DRAWINGS.

3. Joints:

a. Inter-relationship of components.

B. Samples:

1. 12-inch square minimum sample of each panel type proposed, illustrating edge, corner, and joint-seam system.
2. 3-inch square paint samples.
3. 6-inch-long samples of furring.

C. Documentation:

1. Job Names, Owner, General Contractor, and Architect telephone numbers of job experience

D. Manufacturer's and installer qualifications.
E. Manufacturer certification of conformance to specification.
F. Warranties.

1.5 QUALITY ASSURANCE

A. Panel Manufacturer Qualifications:

1. Minimum 25 successful jobs manufacturing formed wall panels similar to that proposed.

B. Installer Qualifications:

1. Approved in writing by the wall panel manufacturer, specifically for this project.
2. Document five comparable projects in Alaska with metal panels completed by the proposed installer. Submit job names, owner, general contractor, and architect phone numbers

1.6 PRE-INSTALLATION CONFERENCE

A. Attended by CONTRACTOR, installer, manufacturer's representative, and OWNER'S Representative.
B. Schedule in advance of start of work and when at least part of walls are ready

for installation.

C. Submittals and samples of panel materials shall be approved and available at conference.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Installation of Expansion Joints and Sealants:
   1. Temperature between 35 and 55 degrees F.
   2. Substrate and siding surfaces free of rain, snow, or frost.

1.8 WARRANTIES

A. Panels: Manufacturer's 10-year warranty that panels will not rupture, fail structurally, or perforate due to corrosion.
B. Paint Finish: Manufacturer's 10-year warranty covering color fade, chalking, peeling, cracking, or blistering.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to meeting specification requirements.

   1. AEP Span: www.aepspan.com
   2. Metal Sales: www.metalsales.us.com
   3. Kingspan Group: www.kingspanpanels.com

2.2 METAL PANELS

A. Steel factory painted, corrugated rib profile with exposed, color-matched gasket head screw fasteners. Continuously factory roll formed: similar to AEP Span "Nu-Wave Corrugated".

   1. Types:

      a. Type 1 "Nu-Wave Corrugated" for vertical panels.
      b. Type 2 "Nu-Wave Corrugated" for horizontal panels.

   2. Minimum width:

      a. Type 1 & 2 36-inches.

   3. Minimum length: full height of wall, no end joints permitted.

4. Sheet steel: ASTM A792 Zincalume®, minimum yield 50,000 psi, Thickness 22 gauge / Pre-finished galvanized steel sheet 0.030 inch base metal thickness.
5. Provide attachment clips sized and spaced for wind loads.

2.3 FLASHING AND TRIM

A. As indicated on the DRAWINGS for exposed perimeter edges and penetrations and as recommended by the panel manufacturer for complete weathertight installation.
B. 22 gage galvanized sheet steel accurately formed from material matching panels and in accord with SMACNA recommended practices and approved shop drawings.
C. 10 feet minimum flashing lengths.
D. Corners: 3.5-inch minimum wide with hem edges.
E. Drip Edges with 45-degree self-hem edges.
F. Same finish and color as adjacent panel.

2.4 PANEL FACTORY APPLIED COLOR COATING

A. Prime both sides; complete finish exposed exterior side.
B. Duranar KL Plus, Polyvinylidene fluoride, (PVDF) coating system with minimum 70 percent resins complying with AAMA 621. Silicone polyester allowed on interior surface.
C. Coating Thickness: minimum 1.9 mil: Primer 0.7 – 0.8 mil, Finish Coat 0.7 – 0.8 mil. and Top Clear Coat 0.45 – 0.55 mil.
D. Gloss: 8-15 at 60 degrees in accord with ASTM D523.
E. Weathering - no checking, blistering or adhesion loss when tested for 5,000 hours in accordance with ASTM D822.
F. Chalking - no chalk greater than No. 8 rating when tested for 2,000 hours in accordance with ASTM D4214.
G. Fading - color change shall not exceed 5 units when tested for 2,000 hours in accordance with ASTM D2244.
H. Salt Spray - no more than 1/16-inch creep or tape off from scribe and less than 5 percent No. 8 blisters when tested for 750 hours in 5 percent salt fog at

95 degrees F. in accordance with ASTM B117.

I. Flexibility - no rupture of coating when bent 180 degrees in accordance with ASTM D4145.
J. Hardness: HB pencil hardness: no film failure when tested in accordance with ASTM D3363.
K. Abrasion Resistance: withstand 50 liters falling sand before appearance of base metal in accord with ASTM D968.
L. Two of manufacturer's standard or premium colors including metallic colors will be selected. Match for flashing and trim.

2.5 FASTENERS

A. Screws recommended by the panel manufacturer but not smaller than Number 14 diameter stainless steel or carbon steel corrosion resistant coated to resist 1000 hours of salt spray per ASTM B117 test, or 15 cycles per ASTM G87 – Keternich Cabinet Testing, with no more than 5 percent red rust appearing on head or shank.
   Screws shall completely penetrate materials to be joined.

   1. Minimum 1-1/2 inch length for panel fasteners into structure.

B. Exposed fasteners: Number 14 diameter screws preassembled with 3/4 inch diameter 18 gage tapered lip stainless steel washer bonded to an EPDM sealing washer. Factory paint heads and washers to match panel finish.
C. Rivets or nails not permitted: except rivets permitted for flashing trim. Match panel color for rivets.
D. Minimum pullout value 400 pounds when tested in predrilled pilot holes through 16 gage ASTM A653 steel, or 3/4 inch plywood.

2.6 CLOSURE STRIPS

A. Closed cell laminated polyethylene resilient foam shaped to tightly fit panel shape.
B. 1-1/2 inch minimum width.

2.7 AIR AND WATER BARRIER

A. As specified in 07 27 10.

2.8 SEALANT SYSTEM

A. Single component non-sag urethane or silicone, per ASTM C920.
B. Sealant backer rod: non gassing polyethylene foam filler rod recommended by Sealant manufacturer.
C. Color: Standard color nearest match to panels.

2.9 TAPE SEALANT

A. Resilient polyethylene foam with self-stick adhesive, not less than 50 percent butyl, non asphalt.
B. 3/8-inch minimum width and 1/4 inch minimum thick.
C. Schnee-Moorehead Company; Gaska Tape, Inc. or substitutions in accordance with Section 01 60 00-Product Requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrate, DRAWING Details, and conditions under which panels will be installed.
B. Verify field measurements. Modify work as required for accurate fit.
C. Beginning installation shall mean acceptance of existing conditions as capable of producing an acceptable job.

3.2 INSTALLATION OF METAL PANELS

A. Install in accordance with approved shop drawings and manufacturer’s written instructions and over air water barrier.
B. Erect panels parallel with vertical lines plumb.
C. Screw attach panels 8 inch on center maximum in evenly spaced horizontal rows at 36 inches maximum into furring or structure.
D. Install edge trim and closure strips in continuous sealant and through screws at exposed edges and around penetrations.
E. Secure panels without warp or deflection.

F. Install joints in continuous bead of sealant or tape sealant.
G. Center penetrations in panel where possible. Provide elongated hole to accommodate thermal movement.

3.3 INSTALLATION OF FLASHINGS AND ACCESSORIES

A. Conform to panel manufacturer instructions and approved shop drawings.
B. Provide 3-inch lapped joints or inside backed butt joints with thermal expansion space.
C. Fastener spacing 12 inches maximum and 2 inches maximum from edges.
D. Provide thermal movement space around penetration spaces. Seal with continuous sealant or sealant tape.
E. Seal flashing joints in lapped bed of sealant or sealant tape.

3.4 TOLERANCES

A. Panel Flatness: 1/4 inch out of plane from panel edges maximum.
B. Alignment: 1/4 inch in 10 feet, maximum variation.

3.5 CLEANING

A. Remove cuttings and metal shavings from finished surfaces at the end of each day. Remove stains and excess sealant immediately.

END OF SECTION

SECTION 07 62 10
FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Section 06 10 00 - Rough Carpentry
B. Section 07 41 14 - Metal Standing Seam Roof Systems
C. Section 07 42 13 - Metal Wall Panels
D. Section 07 92 00 - Joint Sealants
E. Section 08 11 10 - Hollow Steel Doors and Frames
F. Section 08 54 13 - Fiberglass Windows
G. Section 09 91 00 - Painting

1.2 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this Specification. Publications may be referenced in the text by basic reference only. In case of conflict, the most stringent shall govern.

1. American Society for Testing Materials (ASTM) specific references as noted.
2. ANSI/ASTM A167 - Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
3. ASTM A480 - Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.
4. ASTM A653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
5. ASTM B117 – Practice for Operating Salt Spray (Fog) Apparatus.
6. ASTM B209 - Specification for Aluminum and Aluminum-Alloy, Sheet and Plate.
7. ASTM B749 – Specification for Lead and Lead Alloy Strip, Sheet and Plate Products.
8. ASTM C920 - Specification for Elastomeric Joint Sealant.
9. ASTM D146 - Test Methods for Sampling and Testing Bitumen-Saturated Felts and Fabrics Used in Roofing and Waterproofing.
10. ASTM D779 – Standard Test Method for Water Resistance of Paper, Paperboard, and other sheet materials by Dry Indicator Method
11. ASTM D828 – Tensile Properties of paper and paperboard using Constant-Rate of Elongation Apparatus.

12. ASTM D1004 - Test Methods for Initial Tear Resistance of Plastic Film and Sheeting.
13. ASTM D1876 - Test Methods for Peel Resistance of Adhesives.
14. ASTM D1970 - Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials used as Steep Roofing Underlayment for Ice Dam Protection.
15. Sheet Metal and Air Condition Contractor's National Association (SMACNA) "Architectural Sheet Metal Manual".
16. National Roofing Contractors Association (NRCA) Roofing and Waterproofing Manual.
17. American Welding Society (AWS) "Code for Welding in Building Construction".
18. Society for Protective Coatings (SSPC) Systems and Specifications.
19. International Building Code (IBC).
20. American Architectural Manufacturers Association (AAMA) 621 – Voluntary Specifications for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized and Zinc-Aluminum Coated Steel Substrates.

1.3 SUBMITTALS

A. Shop Drawings and Manufacturer's Literature: Including dimensions, materials, joints, fasteners, anchorage, installation recommendations, details and location in complete work if work proposed differs from Contract DRAWINGS.

PART 2 - PRODUCTS

2.1 GALVANNEALED STEEL SHEET

A. American Society for Testing and Materials ASTM A653 cold rolled steel sheet, lock-forming quality. Hot-dip Galvannealed zinc coating both sides of at least 0.90 ounce per square foot total. (G90).
B. Minimum thickness 22 gage except unbacked spans over 12 inches 20 gage unless indicated otherwise. Special thickness per DRAWING details. Anchor clips and hook strips 20-gage.

2.2 FLEXIBLE FABRIC ROOFING FLASHING

A. EPDM sheeting reinforced .060 inches minimum thickness as recommended by manufacturer for exterior exposed installation.
B. Flashing shall be flexible to minus 30 degrees F. minimum.
C. Use manufacturer's recommended adhesives and sealants.

D. Johns Manville, Firestone, or Carlisle.

2.3 FLEXIBLE RUBBER-ASPHALT FLASHING

A. Pre-Manufactured, elastomeric, self-adhering, self-sealing sheet membrane waterproofing composed of high-strength polyethylene sheet plastic bonded to rubberized asphalt per ASTM D1970 recommended by manufacturer for application as concealed flashing meeting the following requirements.

1. Total thickness: 40 mil minimum.
2. Maximum load at break: 25 pounds per inch per ASTM D1970.
3. Elongation at break, asphalt: 10 percent minimum per ASTM D1970.
4. Low Temperature Flexibility: 180-degree bend over 1 inch mandrel at minus 20-degree F without cracking per ASTM D1970.
5. Overall adhesion between Plywood and to adjacent membrane at 40 degrees F: 3.0 pound per inch width minimum per ASTM D1970.
6. Sealability around nail: pass per ASTM D1970.
7. Removable release paper.
8. Primer: as recommended by underlayment manufacturer for conditions of use.

B. Approved manufacturer subject to meeting specified criteria:

1. W.R. Grace “Bituthene Ice and Water Shield” roof flashing or “Perm–A-Barrier wall flashing” by W. R. Grace, www.wrgrace.com,
2. “CCW-705 TWF” - www.carlisleccw.com
3. Hohman & Barnard “Flex-Flash” by, www-h-b.com,
4. Fortifiber Building Systems “Moistop Next” by, https://henry.com/residential-and-light-commercial/

C. Substitutions in accordance with Section 01 60 00 - Product Requirements.

2.4LIQUID APPLIED MASTIC FLASHING

A. Liquid applied mastic recommended by manufacturer for wall opening penetrations, self -sealing around fasteners.
B. Approved manufacturers: subject to meeting specified criteria:

1. Dow Corning “Liquid Armor”, www.dowcorning.com
2. Prosoco “R-Guard”, www.prosoco.com
3. Dupont “TyvekFluid Applied Flashing”, www.dupont.com

2.5FASTENERS

A. Number 14 (1/4 inch) stainless steel or corrosion and abrasion resistant coated carbon steel resistant to 1000 hours salt spray per ASTM B117 or 15 cycles per ASTM G87 – Kesternich Cabinet Testing;testing with 15 percent maximum red rust, and no coating blistering or cracking on head or shank.

B. Exposed fasteners: Number 14 (1/4 inch) diameter screws preassembled with a 3/4-inch diameter 18-gage tapered lip stainless steel washer bonded to an EPDM sealing gasket washer. Factory paint heads to match adjacent metal color.
C. Use button or pan head Phillips screws for concealed work.
D. Nails and pop rivets not permitted.
E. Screws shall penetrate metal substrate 1/2 inch or penetrate wood substrate 1-1/2 inches.

2.6ACCESSORIES-ATTACHMENTS

A. Primers, clips, hook strips, angles, cover plates, inserts and other accessories, as necessary for secure attachment shall be the same material as flashing and in accordance with SMACNA and NRCA recommendations. Fabricate anchor clips and hook strips one gage thicker than attached flashing.
B. Reglets: Surface mounted type, 5 inches high minimum, for continuous sealant fillet, Fry type SM or equal substitution.
C. PVC Reglet built into masonry joint, 5/8-inch internal depth to fit into 3/8-inch mortar joint, face piece keeps mortar out and tears off prior to installation. Hohman & Barnard-Sandell: www.h-b.com or equal.

2.7SEALANTS

A. Single component silicone or urethane per ASTM C920.

1. Tape sealant may be used for straight lap joints: 50 percent butyl, 1/4 to 1/2 inch width and thickness.

B. Color: Standard color nearest match to flashing finish color for exposed sealants.

2.8PAINT

A. Shop prime and shop finish paint exposed surfaces.

1. One coat zinc-base topcoat compatible primer.
2. Two coats urethane enamel, semigloss.

B. Coil factory coated Polyvinylidene fluoride, (PVDF) coating system with minimum 70 percent resin complying with AAMA 621 finish is acceptable in lieu of shop paint if steel thickness is equal to that specified.

2.9 METAL FABRICATION

A. Fabricate per approved submittals and the best commercial practice of SMACNA and NRC. Form sections square, true and accurate to size, free from distortion and to fit substrate.
B. Fabricate sheets or panels in longest lengths practical, true to details, free of dents, scratches and tool marks. Make allowances for thermal expansion-contraction at joints.
C. Cross break as necessary to prevent “oil canning”. Form lines and edges straight and neat. Form bent-metal corners to smallest radius possible without causing grain separation. Roll exposed edges back on underside to form folded, hemmed edge, 1/2 inch minimum (3/4 inch minimum to engage hold down). Slope exposed vertical bottom edges 45 degrees to form drip.
D. Welding shall be per AWS for type of weld and material. Grind exposed welds smooth and flush. Coat welds and bare metal abrasions in galvannealed steel with SSPC 20 zinc rich epoxy primer paint.
E. Joints shall be weathertight and have provisions for expansion and contraction. Lap joints and corners watertight. Lap in direction of water flow. Provide slotted holes at exposed gasketed screws.

2.10 SHOP CLEANING AND PAINTING

A. Clean metal prior to painting by “solvent cleaning” SP-1, followed by acid etch and “hand cleaning” SP-2 per SSPC.
B. Shop paint 1 primer coat and 2 finish coats per finish paint manufacturer’s instructions.
C. Factory Coil paint PVDR coating per AAMA 621 is acceptable in lieu of shop paint.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the DRAWING details and field conditions to receive the work for defects that will adversely affect the completed work and for deviations beyond allowable tolerances.
B. Beginning of installation shall mean acceptance of existing conditions as capable of producing an acceptable job.

3.2 DISSIMILAR MATERIALS

A. Steel contacting aluminum, concrete, masonry or treated wood shall have contact surfaces separated by a heavy coat of bituminous paint, 40 mil self-adhering rubber sheet or by non-absorptive tape.
B. Separation materials shall be trimmed to not be visible in exposed completed work.

3.3 INSTALLATION

A. Install all flashings in accordance with the best commercial practice of SMACNA, NRCA and in accordance with approved submittals, plumb, level, or to alignment shown on the DRAWINGS.
B. Joints shall be weathertight and have provisions for expansion and contraction. Lap to shed water flow outside.

    1. Lap flashing over door and window head and sill.
    2. Lap metal flashing 4-inch minimum with sealant tape to shed water.
    3. Extend flashing 8-inch minimum above roofing.

C. Provide roofing edge flashing and parapet flashing joints with 5-inch wide inside cover plate set in sealant and gasket head screws one side allowing 1/2-inch movement space between flashing: or overlap 4-inch minimum in sealant with gasket head screws along open seams 4-inch on center.
D. Cut components neatly to fit against adjacent member.
E. Field cut members exposed in the completed work so that finish is not damaged. Leave no exposed sharp edges.
F. Length of screws shall be sufficient to fully penetrate sheet metal or plywood fastened and 1 1/2-inch minimum into solid backing.
G. Cutting or drilling of building structural components shall not be permitted unless approved by ARCHITECT in writing.
H. Touch-up steel with paint primer and finish coat equal to adjacent panel finish coating at bare metal abrasions.
I. Fasten metal flashing at exterior edges with continuous galvanized holdown hook strip, 20-gage minimum, screwed at 12-inch on center, with No. 14 screws, holding cleat, penetrating at least 1 1/2 inches into solid backing. Set hold-downs in continuous sealant. Fasten interior side of parapet flashing 12 inches on center with 1/4-inch steel screws and seal washers through flashing holes slotted to allow thermal movement.
J. Secure metal counterflashing into a reglet joint by use of screws. Fill the

reglet continuously after flashing installation with silicone-based sealant sloped to shed water.

K. Install liquid applied mastic flashing in and around wall penetrations including windows and doors.

3.4 ANCHORAGE AND ATTACHMENT

A. Spacing and quantity of anchor fasteners as indicated and required to develop permanent weather tight joints on exterior work.
B. Maximum spacing of exposed fasteners shall be 12-inches evenly spaced within 1-1/2 inches of panel edges unless closer spacing is indicated.

3.5 SEALANT APPLICATION

A. As recommended by sealant manufacturer approved submittals, to provide permanent, weathertight joints. Set lapped seams in sealant bed or sealant tape.
B. Joints shall be sealed continuously against the weather and have provisions for expansion and contraction.
C. Seal moving lap flashing joints with 2 rows of sealant tape.

END OF SECTION

SECTION 07 72 53
ROOF SNOW GUARD SYSTEM

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Section 07 41 14 –Metal Standing Seam Roof System

1.2 APPLICABLE PUBLICATIONS

A. The publications listed form a part of this Specification. The publications are referred to in the text by basic designation only. In case of conflict the most stringent shall apply.

1. ASTM A653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
2. ASTM A792 - Specification for Steel Sheet, 55 percent Aluminum-Zinc Alloy-Coated by Hot-Dip Process.
3. ASTM B85 Specification for Aluminum – Alloy Die Castings.
4. ASTM B117 - Practice for Operating Salt Spray (Fog) Apparatus.
5. ASTM B221 – Specifications for Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.
6. International Building Code (IBC), Chapter 16.
7. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) - Architectural Sheet Metal Manual.
8. Metal Construction Association (MCA) – Metal Roof Design for Cold Climates.

1.3 PERFORMANCE REQUIREMENTS

A. Provide Snow Guard Attachment attachment to the standing seam metal roof as follows:

1. Clamp onto each roof seam - No paint damage and only minor dimpling of panel ribs.
2. No penetrations through roof seams or panels.
3. No sealants or adhesives.
4. Roofing paint & weather tight warranties approved.
5. Break away allowing excess snow-ice to not damage metal roofing.

B. Loading: less than downslope vector load used for the metal roofing.

Reference structural engineers Drawings. Provide load test data.

C. If snow load exceeds design load per clamp; clamp shall break away without roof damage.

1.4 SUBMITTALS

A. Shop Drawings, Calculations and Product Data to Illustrate:

1. Conformance with Performance Requirements:
2. Clamp shaped to fit roofing standing seam with load test information.
3. Installation location layout and details:
    a. Dimensioned roof layout plan of snow guards.
    b. Attachment clamp spacing, location, and screw torque.
4. Fasteners:
    a. Type, corrosion resistance, size and spacing to be used.
5. Joints:
    a. Configuration of components and screw anchors.

B. Samples:

1. Submit 18-inch long, illustrating clamp system with cross member.
2. 3 -inch long paint samples of proposed sheet metal.

C. Certificates:

1. Manufacturer’s certification of conformance to performance requirements.

1.5 QUALITY ASSURANCE

A. Snow Guard Manufacturer Qualifications:

1. At least 25 successful jobs manufacturing non-penetrating fastener onto standing seam metal roofing similar to that proposed.
2. Snow Guard Manufacturer shall have recommended installation details based on snow load and slope.

B. Pre-Installation Conference: Attended by CONTRACTOR, Installer, and OWNER’S REPRESENTATIVE.

1. Schedule conference in advance of start of work.
2. Approved submittals and samples of snow guard materials shall be available at conference.

C. Test clamp screw tensions, for compliance with approved snow guard manufacturer, at 5 locations selected by OWNERS REPRESENTATIVE.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to meeting specified criteria:

1. Metal Roof Innovations: www.S-5.com
2. AceClamp: www.aceclamp.com
3. Alpine Snowguards: www.alpinesnowguards.com

2.2 COMPONENTS:

A. Clamps: shaped to allow non penetrating clamp onto indicated metal roofing profile.

1. Smooth round bullet nose shaped stainless steel screw contacts with roofing.
2. Manufactured from 6061-T6 aluminum extrusions and conforming to ASTM B221 or aluminum castings conforming to ASTM B85.

B. Cross Member Attachment Brackets:

1. Manufactured from 6061-T6 aluminum extrusions conforming to ASTM B221.
2. Screws for attachment of brackets to clamp: stainless steel.

C. Cross Members:

1. Manufactured from 6061-T6 aluminum extrusions conforming to ASTM B221.
2. Receptacle face to receive metal strip insert.
3. Provide splice connectors ensuring alignment and structural continuity at end joints.
4. Color Strip inserts into extruded cross members. Same material and finish as roof panels: 24 gage sheet steel Kynar/Hylar paint finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrate, DRAWING Details, and conditions under which roof Snow

Guards will be installed.
B. Verify field measurements. Modify work as required for accurate fit.
C. Verify snow guard installation will not impede roof drainage.
D. Beginning installation shall mean acceptance of existing conditions as capable of producing an acceptable job.

3.2 PREPARATION

A. Clean areas to receive attachments; remove loose and foreign matter between snow guard clamp and roofing.

3.3 SNOW SLIDE GUARD INSTALLATION

A. Install where indicated on approved roof layout plan.

1. As a minimum, starting two feet above eave to 6 feet below highest location on sloped roof.

B. Install system in accordance with snow guard manufacturer's instructions and approved shop drawings.
C. Place clamps in straight aligned rows.
D. Tighten clamp screws to manufacturer's recommended torque using calibrated torque wrench.
E. Insert-color-matched metal strips into cross members.
F. Attach cross members to clamps; tighten bolts to manufacturer's recommended torque.
G. Install splice connectors at cross member end joints.

3.4 TOLERANCES

A. Alignment: 1/4 inch in 10 feet, maximum variation.

3.5 ADJUSTING AND CLEANING

A. Remove cuttings and metal shavings from finished surfaces at the end of each day.

END OF SECTION

SECTION 07 92 00
JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Section 06 12 00 – Structural Insulated Panels
B. Section 06 20 10 – Finish Carpentry and Architectural Woodwork
C. Section 07 26 00 – Vapor Retarders
D. Section 07 27 10 – Air and Water Barriers
E. Section 07 63 10 – Flashing and Trim
F. Section 08 11 10 – Hollow Steel Doors and Frames
G. Section 08 54 13 – Fiberglass Windows
H. Section 09 21 16 – Gypsum Board Assemblies
I. Section 09 91 00 – Painting
J. Division 21, 22, 23 – Plumbing
K. Division 23 – Heating
L. Division 26, 27, 28 – Electrical

1.2 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this Specification. The publications are referred to in the text by basic designation only. In case of conflict only the most stringent shall govern.

1. ASTM C510 - Test Method for Staining and Color Change of Single or Multicomponent Joint Sealants.
2. ASTM C717 - Terminology of Building Seals and Sealants.
3. ASTM C719 – Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle).
4. ASTM C834 - Specifications for Latex Sealants.
5. ASTM C919 - Practice for Use of Sealants in Acoustical Applications.
6. ASTM C920 - Specification for Elastomeric Joint Sealants.

7. ASTM C1193 - Guide for Use of Joint Sealants.
8. ASTM C1330 – Specification for Cylindrical Sealant Backing for use with Cold Liquid Applied Sealants
9. ASTM D1667 - Specification for Flexible Cellular Materials Poly Vinyl Chloride Polymers and Copolymers Foam (Closed-Cell).

1.3SUBMITTALS

A. Sealants including colors, backing, bond breaker: Manufacturer's Literature: Including recommendations for cleaning substrate, application temperatures and compatibility with adjoining surfaces and application.

   1. Verify Sealant adhesion, primer and staining requirements.

B. Product Labeling: Each sealant material container shall bear manufacturer's label and name, type, color, and applicable standards.
C. Installer qualifications.

1.4QUALITY ASSURANCE

A. Manufacturer of sealant shall have been in business of manufacturing construction sealants with at least 500 successful projects of similar size.
B. Applicator shall be responsible for verifying sealants used are compatible with joint substrates.

1.5DELIVERY AND STORAGE

A. Deliver in manufacturer's original unopened container, clearly indentifying each product.
B. Store in accord with manufacturer's recommendations.

1.6TEMPERATURE REQUIREMENTS

A. Do not apply sealants at ambient temperatures below those recommended in writing by the manufacturer, and in no case, in rain or snow, or with, dirt, frost or water on the components.
B. Install sealants in metal flashing and glazing with temperature between 25 and 55 degrees F. by temporary enclosure and heating as necessary for 12 hours before, during and 24 hours after installation.
C. Protect sealants until cured.

PART 2 - PRODUCTS

2.1 GENERAL

A. Compatibility: Provide sealants, backing, and primers that are compatible with one another and recommended by manufacturer for substrates and for conditions of service.
B. Acceptable Sealant Manufacturers: Subject to compliance with specified criteria:

1. Dow Corning www.dow.com
2. General Electric www.gesealants.com
3. Tremco www.tremco.com
4. Sika Corporation www.usasika.com
5. Sonneborn www.sonneborn.com

2.2 TYPICAL JOINT SEALANTS

A. Typical use unless otherwise noted:

1. Single component non-sag, non-staining, silicone type.
2. Movement range 50 percent, plus or minus.
3. Shore A hardness 15-25.
4. Recommended in writing by manufacturer for condition of use.
5. ASTM C920.
6. Color: match adjacent surfaces as closely as possible unless indicated otherwise on the DRAWINGS, using one of the manufacturer's standard colors of including black, white, brown, grey and translucent.

B. For metal flashing, tile and vapor retarder and as indicated or specified in applicable product sections:

1. Single component non-sag non-staining polyurethane type.
2. Movement range plus or minus 25 percent.
3. Shore A hardness 25-40.
4. ASTM C920.
5. Color: Same as those specified for silicone.

2.3 DRY FOAM TAPE SEALANT

A. Self-stick adhesive roll form with resilient PVC foam core per ASTM D1667.

1. Pressure sensitive adhesive one side.
2. 3/16-inch minimum thickness or as necessary for 30 percent compression in completed joint.

3. Closed cell water absorption: none.
4. Corrosive reaction to bare metal: none.
5. Service temperature range: 65 degrees F - 200 degrees F.
6. Storage life: indefinite at 100 degrees F or below.
7. Shrinkage: none.

B. Acceptable Manufacturers: Subject to specified criteria:

1. Schnee-Morehead, Inc. (ITW) www.gluespec.com
2. Gaska-Tape Inc. www.gaska.com
3. Saint Gobain Norseal www.tapesolutions.saint-gobain.com

2.4 ACOUSTICAL (SOUND) SEALANT

A. Single component non-sag ASTM C834 non hardening acrylic latex, or synthetic rubber recommended in writing for condition of use.
B. Surface fire characteristics: flame spread 5, smoke developed 0.

2.5 BACKING MATERIALS AND BOND BREAKERS

A. Flexible non-gassing polyethylene or polyurethane foam backing filler rod and bond break tips in accord with ASTM C1330 and recommended in writing by the sealant manufacturer for joint conditions. Bond breaker materials shall not stain adjacent materials.
B. Oversized thirty to fifty percent larger than joint width.
C. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application to prevent 3-sided adhesion where backer rod cannot be used.

2.6 PRIMERS AND CLEANERS

A. Recommended in writing by the sealant manufacturer for the joint material and condition of use.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine DRAWINGS and field conditions to receive sealants for defects that will adversely affect the work, and for deviations beyond allowable tolerances.
B. Beginning of installation shall mean installer accepts existing conditions as

capable of producing an acceptable job.

3.2PREPARATION

A. Clean and remove loose dirt, oil, corrosion, curing agents, protective coatings, existing sealants, waterproofers, moisture, frost and other foreign material from surfaces to receive sealants and primers using approved techniques and cleaning agents recommended by sealant manufacturer.
B. Paint: Where scheduled shall be applied after sealant application.
C. Primer: Where recommended by sealant manufacturer shall be neatly applied before back-up materials and sealant application. Mask or otherwise protect adjacent surfaces from excess primer.

3.3BACKING MATERIALS AND BOND BREAKERS INSTALLATION

A. Install in accordance with ASTM C1193, approved sealant manufacturer's written recommendations and the following. Apply acoustical sealants in accord with ASTM C919. Verify non-staining of adjacent porous materials and compatibility.
B. Use joint backer bond breaker filler rod for joints over 1/4- inch wide.
C. Allow for manufacturer's recommended width to depth ratio. Do not set deeper than width of joint.
D. Do not stretch lengthwise to joint.

3.4SEALANT INSTALLATION

A. Apply in accordance with manufacturers written recommendations for conditions of use.
B. Mask as necessary to provide straight neat edges.
C. Size sealant materials to achieve sealant manufacturer's recommended width to depth ratio: typical depth in joint shall be 1/2 width of joint. Sealant depth shall be 1/4 to 3/8 inch and joint width at least 2 times expected movement.
D. Install weep tubes to drain exterior cavities to outside at 16 inch maximum spacing.
E. Lapped joints: shall receive continuous bed of sealant or sealant tape before assembly. Whenever practical, joints shall be bedded or coated continuously before assembly. Lap joint sealant shall have a minimum lap width of 3/8 inch

by 1/4-inch minimum depth.

F. Apply under continuous pressure ahead of sealant gun.
G. Tool joints as soon as possible to produce a consistent smooth joint without voids and foreign matter shape sealant to shed water.
H. Completed sealed joints shall have uniform, straight sealant bead free of voids, sags, and foreign material.

3.5JOINTS TO RECEIVE SEALANT

A. Exterior: Building joints exposed to the weather and moisture in the completed work as specifically indicated on DRAWINGS and including:

1. Door and window frames.
2. Thresholds.
3. Pipe and duct penetrations in walls and roof
4. Metal roof and wall panels.
5. Flashing joints.
6. Top of reglets.
7. Panel joints and intersections of Structural Insulated Panels

B. Interior as specifically indicated on DRAWINGS and including:

1. Around edges of electrical and telephone outlet boxes in gypsum board walls and cover entire back of box in offices, conference room and toilet room walls (acoustical Sealant).
2. Around mounting flanges of plumbing fixtures such as sinks, lavatories and water closets.
3. At floor and untaped top of gypsum wallboard at deflection head of walls.
4. Floor joints to wall joints in mechanical rooms.
5. Countertop joints to adjacent surfaces.
6. Around door frames.
7. Around window frames.
8. Around pipe and duct penetrations in walls and roof.

C. Other Joints: As indicated on DRAWINGS and SPECIFICATIONS.

3.6CLEAN UP

A. Remove surplus materials and excess sealant from surrounding surfaces at completion of each day’s work.

END OF SECTION

SECTION 08 11 10
HOLLOW STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Section 07 21 10 – Building Insulation
B. Section 07 92 00 – Joint Sealants
C. Section 08 71 00 – Door Hardware
D. Section 09 21 16 – Gypsum Board Assemblies
E. Section 09 91 00 – Painting: Field painting of doors and frames

1.2 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this Specification. The publications may be referred to in the text by basic designation only. In case of conflict the most stringent shall apply.

1. ASTM A568 – Standard Specification for Steel, Sheet, Carbon and High Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.
2. ASTM A653 – Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot Dip Process.
3. ASTM A924 – Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
4. ASTM C920 – Standard Specification for Elastomeric Joint Sealants
5. ASTM C1036 – Specification for Flat Glass.
6. ASTM C1048 – Specification for Heat-Treated Flat Glass – Kind HS, Kind FT Coated and Uncoated Glass.
7. ASTM C1172 – Standard Specification for Laminated Architectural Flat Glass.
8. ASTM E2112 – Standard Practice for Installation of Exterior Windows, Doors, and Skylights.
9. ASTM E2190 – Specification for Sealed Insulating Glass Unit Performance and Evaluation.
10. National Fire Protection Association (NFPA) NFPA 80 – Standard for Fire Doors and Windows.
11. NFPA 252 – Standard Methods of Fire Tests of Door Assemblies.

12. Steel Door Institute (SDI) /ANSI A 250.8-Recommended Specifications for Standard Steel Doors and Frames.
13. Steel Door Institute (SDI)/ SDI-105 (ANSI A250.11) – Recommended Erection Instructions for Steel Frames.
14. Underwriters Laboratories (UL) 10C – Positive Pressure Fire Tests of Door Assemblies.
15. National Association of Architectural Metal Manufacturers (NAAMM) Hollow Metal Manufacturers Association Division (HMMA) Standard NAAMM: HMMA 810 – Hollow Metal Doors 820 - Hollow Metal Frames.
16. NAAMM: HMMA – Standard 840 - Installation and Storage of Hollow Metal Doors and Frames.
17. Society for Protective Coatings (SPC) – Systems and Specifications.
18. (NAAMM): HMMA 861 – Guide Specifications for Commercial Hollow Metal Doors and Frames.
19. International Building Code (IBC).
20. ANSI Z 97.1 – Safety Glazing Material Used in Buildings – Safety Performance Specifications and Methods of Test.

1.3 SUBMITTALS

A. Indicate frame profile, fire rating, construction, thickness, finish, anchor types and locations, location of cutouts for hardware, reinforcement, glass, and installation-adjustment instructions.
B. Indicate door elevations, fire rating, construction, thickness, finish, internal reinforcement, construction method at edges, top and bottom, cutouts for glazing, and installation-adjustment instructions.
C. Provide a schedule of doors and frames using same reference numbers for details and openings as those on the DRAWINGS.
D. Certificate from Installer that installation meets these SPECIFICATIONS.

1.4 QUALITY ASSURANCE

A. Conform to requirements of HMMA and these SPECIFICATIONS.
B. Fire-rated door and frame construction conforms to IBC.
C. Insulating glass fabricator: 25 similar successful jobs.

1.5 STORAGE AND PROTECTION

A. Store above ground, vertical in dry area, spaced and vented, protected from weather.

PART 2 - PRODUCTS

2.1 DOORS

A. HMMA 861 or SDI/ANSI A250 full flush face hollow steel construction and meeting this specification.

1. Interior Doors: Face sheets 0.042 inch (18 gage).
2. Exterior Doors: 0.053 inch (16 gage).

B. Hardware reinforcements: 0.093 inch (12 gage) at hinges, locks, exit devices, and closers.

C. Door Core

1. Typical Non-Fire Rated:
    a. Manufacturer’s standard stiffeners and filled with sound deadener.
2. Exterior Non-Fire Rated:
    a. Polyurethane or polystyrene foam insulation filled cavity.

2.2 FRAMES

A. HMMA 861 or SDI/ANSI A250 hollow steel construction meeting this specification.

1. Interior Frames: 0.053 inch (16 gage) thick with 5/8-inch stop.
2. Exterior Frames: 0.067 inch (14 gage) thick with 3/16-inch plastic interlocking thermal break.
3. Continuously welded corners finished smooth at exterior and for openings over 3 feet wide. Reinforce knocked down frame corners with joint backer to align joint and mechanical lock in assembled position.
4. Minimum 0.093 (12-gage) reinforcing plates around hardware. Continuous reinforcing along continuous hinges.
5. Fire rated frames to fit glass used labeled per IBC 716, NFPA 252 or U.L. 10C.

B. Jamb Anchors: 0.042 inch (18 gage) minimum hot-dip galvanized evenly spaced not over 24-inches apart and 6-inches maximum from top and bottom of door.

1. Floor Sill Anchors: 16-gage galvanized.

C. U.L.Warnock Hersey, or IBC approved label for fire rating. Window frames: 45-minute rating with 3/4-inch stops unless smaller stops have labeled rating.

2.3 MINIMUM EQUIVALENT GAGE THICKNESS

A. Minimum uncoated steel thickness:

1. 10 gage 0.123 inches.
2. 12 gage 0.093 inches.
3. 14 gage 0.067 inches.
4. 16 gage 0.053 inches.
5. 18 gage 0.042 inches.

2.4 ACCESSORIES

A. Louvers: Roll formed steel, 24 gage slat blades, with frame 50 percent free area, no see through.
B. Frame Silencers: shop drill holes and provide 3 resilient rubber bumpers, each jamb 3/8-inch diameter for force fit into drilled hole per ANSI A156.16 type L03011.

1. Not required on doors with gaskets or weather strip.

C. Glazing Stops: rolled steel channel wrap-around shape height and mitered corners for thickness of glass required to allow U.L. or W.I.I. fire label: Countersunk, corrosion resistant tamperproof screws.
D. Concealed wireways: sheet metal block out around frame mounted electrical devices with wire-way to single location at frame head.

2.5 GLAZING

A. Glass and glazing in accord with glass manufacturer and Glazing Association of North America (GANA) manual.
B. Double glaze exterior doors and frames with 1/4-inch clear tempered safety glass per ASTM C1048 made into sealed insulating units with ½ inch airspace per ASTM E2190 class CBA requirements (overall thickness one-inch).

1. Outboard light: clear Low-E surface number 2: PPG “Solar Ban 60” or approved

C. Glaze interior non-fire rated doors and frames with 1/4-inch clear tempered safety glass per ASTM C1048, roll marks horizontal.
D. Permanently label glass identifying manufacturer, standard complied with and glass thickness in accord with IBC 716 and 2406.

2.6 HARDWARE

A. Coordinate Hardware with Section 08 71 00 – Door Hardware.

2.7 FABRICATION

A. Fabricate in accordance with HMMA 861, SDI/ANSI A250, these specifications, and approved submittals. Doors and frames shall be rigid, exposed welds and fabrication marks ground flush, smooth, neat in appearance, and free from defects, warp, or buckle. Accurately form metal to required sizes and profiles. Close joints tight, even space and flush.
B. Fabricate typical doorframes with 5/8-inch-high integral stops and 2-inch faces except frames in concrete masonry shall have 4-inch header.

    1. Provide window stops with Torx security head screws.
    2. Provide 2-1/2 inch faces with sheet steel enclosure box and wireway or 1/2 inch conduit to allow electrical device installations and wiring connect after frame is installed. Provide wireway from each electrical hardware location to a single electrical connect at frame head on openings scheduled for electric devices. For future electrical installations, provide wireway to strike and middle hinge locations.

C. Prepare doors and frames to receive finish hardware, and glazing specified: Including cutouts, hardware, reinforcing plates welded in place around hardware attachment areas, drilling and tapping for mortised hardware in accordance with approved finish hardware schedule.
D. Reinforce frames wider than 48 inches with formed steel channels, or angles fitted tightly into frame head, flush with top.
E. Prepare frames for silencers specified in Section 08 71 00 – Door Hardware.
F. Attach fire-rating label to each rated frame and door.
G. Close top edge of exterior doors flush with inverted steel channel closure. Seal joints watertight. Provide weep holes in bottom edge.
H. Factory install door louvers.

2.8 DOOR AND FRAME FINISH

A. At building exterior and where indicated: hot dip galvanealed doors and frames with 0.40-ounce zinc coating total both sides, conforming to ASTM A653 or A924 prior to factory preparation and factory prime painting.
B. Typical: factory chemically clean and phosphate treat for paint adhesion of

door surfaces and each side of frames and factory prime paint with rust inhibiting prime paint in accordance with SPC or HMMA recommendations and for compatibility with field finish in accordance with Section 09 91 00 - Painting. Exposed surfaces to be smooth and free of scratches and paint runs.

C. Option: Factory finish paint door and frame with semi-gloss enamel selected from one of manufacturers standard or custom colors.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine DRAWINGS and verify field conditions to receive frames for defects that will adversely affect the work and for deviations beyond allowable tolerances.
B. Beginning of Work shall mean acceptance of existing conditions as capable of producing an acceptable job.

3.2 INSTALLATION

A. Install frames in accordance with SDI-105, or HMMA 861, ASTM E2112 and approved submittal rigidly attached to walls. Install any knocked down frames with tight flush joints.

1. Install frames with electrical hardware to provide continuous wireway from frame mount electrical device to frame head for concealed inside wall wiring.

B. Frame Insulation:

1. Fill frames in sound-acoustic walls with unfaced batts of fiberglass insulation.
2. Fill exterior frames with foamed in place urethane insulation before installation.

C. Seal both sides of frame to adjoining wall surfaces with a continuous bead of silicone sealant in accordance with Section 07 92 00 - Joint Sealants.
D. Do not remove or deface factory applied fire labels during construction. Fire doors and frames without fire labels in place at the time of contract closeout will be rejected.

3.3 GLAZING

A. Install glazing in hollow steel frames and stops in accordance with IBC, Glass Association of North America Glazing Manual and as required to meet fire resistance.

3.4 TOLERANCES

A. Smooth, visually flat surfaces with maximum Diagonal Distortion (Warp) 1/16 inch gap under a straight edge, corner to corner.
B. Plumb and square within 1/16 inch.
C. Doors centered in frames with the following clearances:

    1. Jambs and Head: 1/16 to 1/8 inches.
    2. Bottom: 1/8 to 1/2 inch from threshold or floor finish.

D. Knocked down frame corners, even hairline crack joint, 1mm maximum, faces flush.
E. Allow for and accommodate interfacing indicated substrate tolerances.

3.5 HARDWARE

A. Install after finish painting.
B. Install in accordance with hardware manufacturer's written recommendations, using proper templates for approved hardware in accordance with Section 08 71 00 – Door Hardware.

3.6 ADJUSTING

A. Adjust completed door assemblies to swing freely, close smoothly and latch easily with the latched door in uniform, continuous contact with stops.
B. Closed door shall not rattle.
C. Doors with closers shall self-latch.

END OF SECTION

SECTION 08 31 00
ACCESS DOORS

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Section 09 21 16 - Gypsum Board Assemblies
B. Section 09 91 00 - Painting: Field paint finish
C. Division 21, 22, 23 - Mechanical Systems

1.2 QUALITY ASSURANCE

A. Manufacture and label fire rated access doors and frames to conform to the requirements of Underwriters Laboratories (U.L.) 10B “Fire Tests of Door Assemblies” for conditions of use.

1.3 SUBMITTALS

A. Include sizes, types, anchors, finishes, scheduled locations and installation instructions.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to meeting specified criteria:

1. Milcor Inc. www.milcorinc.com/access-doors
2. Karp Associates, Inc. www.karpinc.com

3. Nystrom Building Products www.nystrom.com/access-doors/fire-rated
4. Williams Brothers Corp. www.wbdoors.com

B. Substitutions: In accordance with Specification Section 01 60 00 - Product Requirements.

2.2 FABRICATION

A. Provide fire resistance labeled doors of same fire rating as wall or ceiling penetrations in fire resistance rated wall or ceiling.
B. Fabricate frames and flanges of 16-gage steel with 16-gage panel door. Insulate with non-combustible non-asbestos filler at fire rated doors.

1. Construct fire doors to produce 1-1/2 hour (B) fire rating, attach label to completed assembly.

C. Weld, grind and fill joints to assure flush and square unit. Provide door and frame flush with surface of surrounding gypsum drywall.
D. Hardware: 175-degree opening full door length steel hinges with continuous stainless-steel pin.

1. Latch: Screwdriver cam latch.
2. Cylinder lock with 2 keys per lock, key all doors alike.

E. Finish: Factory chemically clean and phosphate treat for paint adhesion. Factory prime with rust inhibiting prime paint.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify rough openings for door and frame are correctly sized and located to provide maintenance access.
B. Beginning of installation means acceptance of existing conditions.

3.2 INSTALLATION

A. Install frame plumb and level in wall and ceiling openings.
B. Position to provide convenient access to concealed work requiring access.

C. Secure rigidly in place in accordance with manufacturer's instructions.
D. Adjust locking mechanism to operate smoothly.
E. Coordinate with mechanical and electrical and coiling door installers to provide required access to equipment.

3.3 SCHEDULE

A. Wall Access Doors: 16 inch by 16 inch unless otherwise noted.
B. Ceiling Access Doors: 24 inch by 24 inch unless otherwise noted.

END OF SECTION

SECTION 08 36 10
OVERHEAD SECTIONAL DOORS

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Section 07 92 00 - Joint Sealants
B. Division 26 - Basic Electrical Requirements: Power to single connect at each door.

1.2 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of Specification. Publications may be referred to in the text by basic designation only. In case of conflict the most stringent shall apply.

1. ASTM A653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy - Coated (Galvannealed) by the Hot-Dip Process.
2. ASTM C1172 - Specification for Laminated Safety Glass.
3. ASTM C1048 - Specification for Heat-Treated Flat Glass
4. ASTM E283 - Test method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Differences Across the Specimen
5. ASTM E330 - Test for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
6. National Electrical Code (NEC).
7. National Electrical Manufacturers Association (NEMA).

1.3 GENERAL PERFORMANCE REQUIREMENTS

A. Overhead upward opening insulated steel sectional panel door assembly.

1. Usage: Normal operation 25 times per day. One operation cycle means open door and return to closed position.
2. Electric motor operated.
3. Uniform wind force of 50 pound per square foot positive and negative with door in closed position without causing damage as tested and measured in accordance with ASTM E330. Door operational in wind forces of 20 psf positive and negative.
    a. Deflection of door in horizontal position to be maximum 1/120 of door width.

4. Maximum air infiltration rating .08 cubic feet per minute per square foot of door at 25 miles per hour in accordance with ASTM E283.

1.4 SUBMITTALS

A. Manufacturer experience qualifications.
B. Installer experience qualifications.
C. Shop Drawings and Product Data: Indicate fabrication and control details, locations in project, size of components, guides, anchorage, required clearances, electrical connections and installation instructions.
D. Certificates: certify that door proposed meets these SPECIFICATIONS and CONTRACT DRAWINGS.
E. Copy of warranty.
F. Operation and maintenance instructions.

1.5 QUALIFICATIONS

A. Manufacturer: Company with successful record of manufacturing at least 100 doors similar to that specified within the past 5 years.
B. Installer: Approved by door manufacturer with a minimum of 5 door installations similar to that specified.

1.6 WARRANTY

A. Motor, drive train and springs: for 25,000 operations as registered on mechanical counter or 3 years from Substantial Completion.

1.7 TRAINING

A. CONTRACTOR to demonstrate operation and maintenance to OWNER during project closeout.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to meeting specified criteria.

1. Raynor Garage Doors: www.raynor.com
2. Wayne-Dalton Corporation: www.waynedalton.com
3. Overhead Door Company: www.overheaddoor.com
4. Haas Door: www.haasdoor.com
5. Upwardor: www.upwardor.com

2.2 DOOR PANELS

A. General:

1. Comply with General Performance Requirements.
2. Lap door panel 1-inch minimum each side of opening.

B. Minimum properties: roll formed from commercial quality hot dip galvanized sheet steel per ASTM A653.
C. Panel Construction:

1. Exterior face: ribbed and embossed texture 20 gage minimum thick steel sheet-mechanically interlocked and with plastic thermal break to inside face.
2. Interior face: 26-gage minimum.
3. Insulation core: 1-3/4 inch minimum thick expanded polystyrene or polyurethane rigid insulation.
4. Shape panel-to-panel joint with a double weather strip to interlock between sections in the closed position.

D. End stile caps minimum 16 gage.
E. Reinforce each section on inside with channels unless manufacturer's certification substantiates door meets wind load requirement and acceptable panel deflection in overhead position without reinforcing channels.
F. Provide push-pull handle inside on lower door panel.

2.3 PANEL WINDOWS

A. Three openings minimum 24 inch wide by 8 inch high located in third door panel above floor.
B. Glaze with two, 1/4-inch clear safety glass sheets with airspace between sealed into insulated type glazing.
C. Seal into door panel with inside screw attach frame or continuous rubber gasket, allowing glass replacement.

2.4 PANEL EXHAUST PORTS

A. 4-inch inside diameter round holes for vehicle exhaust gas hose.
B. Closure when not in-use.
C. Mount two (2) in bottom panel.

2.5 FINISH

A. Exterior and interior of door sections chemically treated for paint adherence and factory applied brown or white color enamel or powder coat finish over compatible primer.
B. Other components, attachments and anchors: Hot dip galvanized G60 per ASTM A653

2.6 TRACKS

A. Continuous angle not less than 3-inch minimums by 13 gage (.098 inch). Reinforce horizontal track with added continuous angle.

2.7 COUNTERBALANCE SPRINGS AND CABLES

A. Heavy-duty oil tempered wire torsion springs on continuous ball bearing cross header steel shaft.
B. Galvanized multi strand aircraft type lifting cables with minimum safety factor of 5.

2.8 OPERATION COUNTER

A. Provide sealed non resettable mechanical operation use counter to record number of operations up to 300,000.

2.9 DEAD LOCK

A. Exterior Locking: Five-pin key tumbler cylinder with steel bar engaging track.

    1. Coordinate with building keying and furnish six keys for each door.

B. Interior Locking:

    1. Provide interior slide bolt with hole to receive padlock.

C. Interlock switch to disconnect electrical power when door is locked.

2.10 ANCHORAGE AND ATTACHMENT

A. Necessary angle brackets, bolts, blocking, and closure to anchor and weather seal door assembly and operating assembly to structural surround to resist wind load specified. Anchor tracks to structure jambs with minimum 3/8-inch bolts 12 inches on center through 12 gage brackets.

    1. Locate track to fit surrounding structure and to clear any hoist or wall openings

B. At horizontal tracks: provide minimum 2 inch by 1/8-inch galvanized angle, hangers at 6 foot maximum, with necessary brackets, diagonal braces and fasteners to building structure above opening and at top end of track.

2.11 HINGE AND ROLLER ASSEMBLIES

A. Heavy duty galvanized steel hinges, roller holders and brackets. Track brackets field adjustable for sealing door to jamb.
B. Hardened steel ball bearings on track rollers.

    1. Locate roller at each section and rail meeting point.

2.12 WEATHERSTRIPPING

A. Nylon brush type resilient and suitable for service at minus 20 degrees F.
B. Angled metal clamp mounts with slotted screw attachment screw 6 inch on centers.
C. Head and jambs 1-1/4 inch brush: Sealeze D Series or equivalent Zero or Pemko.
D. Door Section to Door Section: EPDM Rubber or cold weather vinyl or cellular foam.
E. Door Bottom: Flexible double u-shaped EPDM rubber or cold weather vinyl in metal retainer incorporating safety devices.
F. Weather stripping shall be replaceable without removal of track angle mounting or door hardware.

2.13 OPERATION

A. Electrical motor operation sized as recommended by door manufacturer for door and operations specified. Electromagnetic brake and integral thermal overload cutout device. Electrical interlock disconnect for manual operation.

   1. Side mount operator with jackshaft and center trolley.

B. Electrical characteristics: Coordinate with building electrical system.
C. IBC approved testing agency labeled instant reversible heavy continuous duty motor with sealed gear reduction and a power train. Motor separate from drive for ease of maintenance.
D. Adjustable limit switches to set open and close positions enclosed within electrical enclosure; NEMA 1 motor controller with manual reset overcurrent protection.
E. Three button “open-close-stop” NEMA waterproof control box at building interior and exterior, 48 inches above floor. “Open” button requires only momentary pressure. “Close” button requires continuous pressure. “Stop” button stops door instantly.

   1. On-off keyed lock: on exterior side of door.

F. Emergency manual operation by chain hoist which can be engaged from the floor.

   1. Manual movement self-locking at any point of travel.
   2. Continuous chain loop with bottom of loop one to 2 feet above floor: no chain movement when door is motor operated.
   3. Electric interlock which disconnects power when chain hoist is engaged.

2.14 SAFETY DEVICES

A. Full width door bottom edge, pneumatic instant reverse to open upon striking object; rubber covered to provide weather seal: located at bottom edge of door.
B. Electrical photo beam: mount transmitter and receiver: 2 to 3 feet above floor across jambs: obstruction motion reverses door to “open”.
C. Electrical microwave detector each side of door:

   1. Reverses door to “open” with obstruction.
   2. Detects objects, moving in one direction: towards the sensor.
   3. Field adjustable, mount over door.

D. Provide 24 gage galvanized steel covers around exposed moving parts: to 8

feet above floor.

2.15 ELECTRICAL COMPONENTS

A. Provide necessary electrical control, and power supply wiring control boxes, disconnect switch, motor contactor: in conduit from door to connect to building power at a single junction box in door assembly or within five feet of each door.
B. Install electrical components inside appropriate NEC acceptable NEMA enclosures. Raise ignition spark sources 18-inch above floor surface.
C. Products shall be in accordance with (NEC) as amended locally.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine DRAWINGS and verify field conditions that opening to receive door is properly sized to meet manufacturer's tolerances with header level, jambs plumb, backing and supports adequately sized and placed.
B. Verify electrical connect points available and of adequate size and power.
C. Field measure openings. Make required adjustments in fabrication and accomplish necessary corrections to supports before installing doors.
D. Beginning of installation means acceptance of existing conditions as capable of producing satisfactory installation.

3.2 INSTALLATION

A. Install door assemblies in accordance with manufacturer's directions and approved Shop Drawings, for complete functional assembly. Lap door one inch minimum inside structural jambs.
B. Prime paint any bare wood or metal surfaces behind door attachment.
C. Fasten tracks to building structure along opening to meet wind force requirements and as specified in Products. Bolt hanger angles from horizontal track to structure above.
D. Seal exposed joints with continuous silicone sealant or sealant tape.
E. Install doors free of warp, twist, or distortion.

F. Perform work in accordance with NEC as amended locally and applicable sections of Division 16 - Electrical.
G. Coordinate to ensure electrical power and control is operative.

3.3 ADJUST AND CLEAN

A. Adjust moving parts to operate smoothly with safety features operational.
B. Door in closed position shall rest against surrounding opening weatherstrips. Individual door sections shall fit tightly together in closed position.
C. Clean surfaces and surrounding areas of soil and debris resulting from door installation.

END OF SECTION

SECTION 08 54 13
FIBERGLASS WINDOWS

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Section 07 27 10 - Air and Water Barriers
B. Section 07 63 10 - Flashing and Trim
C. Section 07 92 00 - Joint Sealants

1.2 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this Specification. The publications may be referred to in the text by basic designation only. In case of conflict the most stringent provisions shall apply.

1. Glass Association of North America (GANA) - Glazing Manual.
2. Sealed Insulating Glass Manufacturers Association (SIGMA) - Recommended Practices for Vertical Field Glazing of Organically Sealed Insulating Glass.
3. ASTM C1036 - Specification for Flat Glass.
4. ASTM E283 - Test Method for Determining Rate of Air Leakage through Exterior Windows, Curtain Walls and Doors under Specified Pressure Differences across the Specimen.
5. ANSI/ASTM E330 - Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
6. ASTM E331 - Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
7. ASTM E547 - Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Cyclic Static Air Pressure Differential.
8. ASTM E2190 – Specification for Insulating Glass Unit Performance and Evaluation.
9. ASTM E1300 – Practice for Determining Load Resistance of Glass in Buildings.
10. ASTM E2112 – Standard Practice for Installation of Exterior Windows, Doors, and Skylights
11. American Architectural Manufacturers Association/Window and Door Manufactures Association AAMA/WDMA 101/I.S.2-03. Standard/Specification for Windows, Doors, and Unit Skylights.

12. National Fenestration Rating Council (NFRC) certification.

1.3 PERFORMANCE REQUIREMENTS

A. Conform to AAMA/WDMA 101/I.S.2 performance class AW- Heavy Commercial and wind loads specified:

1. Wind loads: No glass breakage or permanent deformation with 40 pounds per square foot positive and negative test pressure in accord with ASTM E330.
2. No water penetration at 7.5 pounds per square foot water resistance test pressure in accord with ASTM E331 or ASTM E547.
3. Condensation resistance: CFR class C45.
4. Thermal resistance “U”; 0.25 maximum.

1.4 SUBMITTALS

A. Submit shop drawings and product data in accordance with Section 013300 – Submittal Procedures.
B. Include dimensions, glass specifications, insect screen specifications, internal cross sections, internal drainage, weather strips, reinforcement, relation to adjacent materials, hardware, anchor methods, materials, and locations.
C. Manufacturer's certificate that window units meet or exceed specified requirements.
D. Manufacturer's installation instructions.

1.5 SAMPLES

A. Submit sample window if other than listed manufacturers are proposed. Approved window sample will be returned for use on work.

1.6 QUALITY ASSURANCE

A. Manufacturer: Company specializing in fiberglass plastic window manufacturer with 5 years experience.
B. Label window and glass indicating compliance with specifications.

1.7 WARRANTY

A. Provide 5-year window manufacturer's warranty.

1. Replace insulating glass units that show obscuration, condensation or cracks.
2. Replace window frames or sash that deflect or crack.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to specified criteria:

1. Cascadia Windows: www.cascadiawindows.com
2. Pella Corporation: http://www.pella.com
3. Milgard: www. milgard.com
4. Marvin: www.marvin.com
5. Accurate Dorwin: http://www.accuratedorwin.com

2.2 WINDOW UNITS

A. Type: Sliding, operable sash as indicated on DRAWINGS.

2.3 FRAMES

A. 3 inch minimum through wall dimension multi-chambered hollow pultruded fiberglass with internal metal reinforcement where necessary to resist wind and gravity deflection and attachment to structure.

1. Form pultruded fiber glass stops, closure trims, weather stops, joint trims and attached flashings for weather-tight fit into window frame section.
2. Nominal wall thickness: 5-layer fiberglass mat reinforced: .05 to .07 inch.
3. Provide internal insulation where necessary to meet thermal requirements.

B. Bevel slope exterior members to shed water.
C. Miter and internally reinforce corner joints watertight and inject with sealant-adhesive.
D. Provide combinations of window units joined by the manufacturer for a single rough opening. Joined mullions shall conform to performance requirements.
E. Arrange fasteners to conceal from view with windows closed.
F. Provide internal drainage of glazing spaces through channels and weep holes to carry moisture to exterior.

2.4 GLASS

A. Sealed triple clear glass argon filled units.
B. Glass thickness to meet wind loads and sound resistance.
C. Float glass per ASTM C1036. Safety glass where indicated on DRAWINGS with air space not less than 1/4 inch.

    1. Low E coating on inside surfaces 2 or 3.
    2. Winter night U value: 0.25 maximum.
    3. Condensation resistance: C58 minimum.

D. Meet Class A, requirements when tested per ASTM E2190 for sealed units.
E. EPDM gaskets. Glass shall be field replaceable without damaging frame.
F. Glaze in accord with GANA manual for resilient watertight installation.
G. NFRC label each window.

2.5 ATTACHMENT ACCESSORIES

A. Frame manufacturers approved fasteners, shims, anchor clips or jamb screws to resist wind load.

    1. Metal Finish: Stainless or galvanized steel.
    2. Fasteners: 1/4-inch diameter stainless or galvanized steel screws. 12-inch maximum spacing all around the rough opening.

2.6 SEALANT

A. Single component silicone per Section 07 92 00-Joint Sealants.
B. Tape Sealant: Self-Stick Adhesive roll form with closed cell resilient foam core per Section 07 92 00-Joint Sealants.
C. Insulating foam sealant: spray applied single component low-expanding foamed in place urethane-isocyanurate foam plastic. Single component pre-mixed spray recommended for window sealing by foam manufacturer.

2.7 FINISHES

A. Exposed Surfaces: Factory powder coat or enamel paint.
B. Color: White, Tan, Brown, or custom color as selected.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces and Drawing details to receive the windows for defects that will adversely affect the work, and for deviations beyond allowable tolerances.
B. Coordinate to provide rough-in dimensions needed for 1/2 to one inch clearance between window and building opening all around.
C. Start of work shall mean acceptance of interfacing surfaces as capable of producing an acceptable job.

3.2 PREPARATION

A. Prepare opening to permit correct installation of window unit and building wall vapor retarder seal and air barrier.

3.3 INSTALLATION

A. Install windows in accordance with manufacturer's instructions, approved submittals and ASTM E2112. Screw through frame or window manufacturers mount clip with 1-inch minimum penetration inch into building surround framing.
B. Maintain alignment with adjacent work. Screw window to building opening and shim without distortion or stress by allowing 1/2 -inch minimum space between window and building rough opening. Minimum 1/4-inch screws evenly spaced 12 inch all around.
C. Install metal flashing over window head.
D. Install flexible liquid applied flashing per Section 07 63 10 – Flashing and Trim over window frame into rough opening at window sill and jambs, and over metal flashing at head. Turn up sill flashing 2 inches minimum at jambs.
E. Seal air and vapor barriers to window frame. Install foam insulation in void spaces around window and rough opening without distorting window frame.
F. Install continuous bead of silicone sealant and related backing materials at exterior and interior of installed assembly as specified in Section 07 92 00 - Joint Sealants.
G. Operating sash shall close and latch easily with weather-stripping in continuous uniform contact.

3.4TOLERANCES

A. Plumb and Level: Plus or minus 1/8 inch from true measurement.
B. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch from 10-feet straight edge.

3.5CLEANING

A. Clean window frames and glass with non-solvent soap.
B. Remove labels and visible markings.
C. Remove debris, excess sealant and stains from surrounding surfaces that were caused by window installation.

END OF SECTION

SECTION 08 71 10
DOOR HARDWARE

PART 1 – GENERAL

1.1 PRODUCTS FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

A. Templates and other installation data required prior to hardware delivery, or at fabricators located off the job site. Furnish in a timely manner per construction schedule.

1.2 RELATED SECTIONS

A. Section 06 20 10 – Finish Carpentry and Architectural Woodwork
B. Section 06 41 16 – Laminate Faced Cabinets
C. Section 08 11 10 – Hollow Steel Doors and Frames
D. Section 08 36 10 – Overhead Sectional Doors
E. Section 10 28 00 – Toilet Accessories

1.3 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this Specification. Publications may be referred to in the text by basic designation only. In case of conflict the most stringent shall govern:

1. Underwriters Laboratories, Inc. (UL) - Fire Resistance Index, and Building Materials Directory.
2. National Fire Protection Association (NFPA) - Standard for Fire Doors and Windows, No. 80.
3. American National Standards Institute/Builders Hardware Manufacturers Association (ANSI/BHMA) A156 series as specified.
4. American Society of Testing and Materials (ASTM) ASTM D1056 - Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.
5. ASTM D2497 - Tolerances for Man-Made Organic Base Filament Single Yarns.
6. Americans with Disabilities Act (ADA) Accessibility Guidelines (ADAAG).
7. International Building Code (IBC).

1.4 PERFORMANCE REQUIREMENTS

A. When manufacturer and model number is given, it shall be used to establish minimum equivalent technical data and performance requirements for other manufacturers unless "no substitute" is specified.

B. Substitutions per Specification Section 01 60 00 – Product Requirements.

1.5 FIRE RESISTIVE OPENINGS

A. When a fire-resistive classification is scheduled, provide hardware compatible with the Underwriters Laboratories (U.L.), Warnock Hersey or other testing agency approved by building authority listed for condition of use required by the opening assembly.
B. Entire opening assembly components shall be compatible and function in compliance with the International Building Code (IBC) 2012 as amended by local building authority.

1.6 SUBMITTALS

A. Samples may be required for any proposed alternatives to hardware listed to establish equivalency. Samples will be returned after inspection.
B. List Manufacturers, model numbers, key schedule, and location and mounting heights of hardware in completed work. Use Contract Document door designations.
C. Provide abbreviation legend for abbreviations.
D. List each door opening separately.
E. Manufacturer's certificate that fire-rated hardware meets specified requirements.
F. Manufacturer's descriptive literature for each different item.

    1. Detail interface between electrical door hardware and fire alarm and security access systems.
    2. Provide point-to-point wiring diagrams for power, signal and control.

G. Maintenance - Adjustment Manuals and parts lists with name and telephone number of stock location.
H. Indicate location of closers on doors and frames.
I. Supply templates to door and frame manufacturers to enable proper sizing and locations of cut outs and reinforcements for hardware.
J. Manufacturers experience qualifications.

1.7 QUALITY ASSURANCE

A. Manufacturers: Companies specializing in commercial building hardware in the U.S. for the past 10 years minimum.

1.8 MANUFACTURER ASSISTANCE

A. Provide assistance of the finish hardware supplier representative knowledgeable in the system specified for the following:

1. Pre-Construction Conference: minimum 1 hour.
2. Final Installation and adjustment and maintenance training of Door Hardware.

1.9 PACKAGING AND MARKING

A. Single group of hardware packaged separately for each opening complete with all necessary accessories, fasteners, key instruction and templates.
B. Mark each package with a group number corresponding to the approved hardware schedule identifying its contents and location in the completed work.

1.10 DELIVERY AND STORAGE

A. Hardware shall be checked upon arrival to job site and acceptance verified by the CONTRACTOR'S Representative in writing.
B. Hardware shall be adequately protected from corrosion and pilferage until acceptance of building.
C. Deliver keys to OWNER by security shipment direct from Manufacturer.

1.11 MAINTENANCE ACCESSORIES

A. Provide special field adjustment and maintenance tools, such as special screwdrivers and wrenches, and dogging keys for each different item supplied.

1.12 EXTRA HARDWARE

A. For repair and maintenance by OWNER provide hardware matching that installed in new work.
1. 2 Door Closers.
2. 2 Key Cylinders.
3. 2 Door Sets of Weather Stripping

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturers are named to provide standard of quality and are subject to specified criteria.

2.2 FINISHES

A. Exterior: ANSI A156.18 No. 630 Satin Stainless Steel (US 32D Stainless Steel, satin finish).
B. Interior: ANSI A156.18 No. 626 Satin Chrome plated (US 26D Brushed Chrome).
C. Matte Aluminum paint for door closers.
D. Mill finish aluminum for weatherstrip and gasket seal mounts.

2.3 MOUNTING ACCESSORIES

A. Screws, bolts, escutcheons, brackets and similar supplemental items as necessary and recommended by manufacturer for conditions of use for complete functional use. Provide stainless steel fasteners which are compatible with both hardware and substrate, and which will not cause dissimilar metal corrosion. Mount surface hardware on doors with shouldered thru-bolts.

2.4 BUTT HINGES (TYPICAL)

A. Provide for doors not scheduled for continuous hinges.
B. Full mortise, plated steel with steel pins at interior, stainless steel with stainless steel pins at exterior:

    1. U. L. listed where used on fire doors: Stanley, Hager, McKinney or Lawrence.

C. Heavy weight hinges not less than 0.180 inches thick on exterior doors, doors over 3 feet wide, and doors over 100 pounds.
D. Standard weight hinges not less than 0.134 inches thick on interior doors three feet and less in width.
E. Doors up to 7 feet high shall have 3 hinges.
F. Doors over 7 feet high shall have a hinge for each 30-inch of door height.
G. Provide ball bearing hinges on doors with closers.
H. Hinges on lockable doors shall have non-removable pins secured with setscrew in barrel or other method tamperproof when door is closed.
I. Width of hinges shall be sufficient to clear trim detail conditions and provide up to 180-degree door swing or until door returns to adjacent wall.
J. 4-1/2 inch minimum height of hinges. For doors over 3 feet wide use continuous hinges.

2.5 MORTISE LOCKSETS

A. Heavy duty commercial mortise type of one manufacturer and design ANSI/BHMA A156.13 Grade 1: Schlage L series with full escutcheon threaded cylinder enclosure with key removable interchangeable key core 7-pin tumbler.
B. Backset 2-3/4 inch.
C. 3/4-inch latch throw typical, except one-inch dead bolt throw.
D. Operating Handles: approximately 4-1/2 inch cast lever handle curved to within 1/2 inch of door face with wrought 7-1/2 by 2-1/4 inch escutcheon trim plate. Knurled or abrasive coating at janitor, mechanical and electrical rooms.
E. U.L. listed for use on fire resistive doors.
F. Boxed strike with extended curved lip to fit jamb.

2.6 CYLINDRICAL LOCKSETS AND LATCHSETS

A. Heavy duty commercial cylindrical type product of one manufacturer and one design ANSI/BHMA 145.2 Grade 1: Best 9K series, Corbin Russwin CL3400 Series or Schlage - interchangeable key core with 7 pin tumbler. [vandal resistant free turn without latch retraction feature when scheduled.]
B. Handle: 5 inches curved return lever Schlage with Standard wrought rose trim. Knurled or abrasive coating at utility, mechanical and electrical rooms.
C. Backset 2-3/4; 3-3/4 inch on exterior doors.
D. 1/2 - inch latch throw, deal locking.
E. U.L. listed for use on fire-resistive doors.
F. Boxed strike with extended curved lip to fit jamb.
G. Non-ferrous and stainless-steel components for marine environment.

2.7 CYLINDRICAL DEADBOLT

A. Heavy duty commercial cylindrical deadbolt, one inch throw, 2-3/4 inch backset, thumb turn inside, key operated outside. Same manufacturer and key system as typical door lockset.

2.8 LOCK CYLINDERS

A. Standard full-face seven pin interchangeable core slander same manufacturer as locksets.

2.9 PUSH BUTTON LOCKS

A. 5-buttom integral mechanical unit with changeable combinations with special tools or removing lock compatible with building lock hardware.
B. Inside always free for egress, ADA lever handles.
C. Approximately 8 inch by 3 inch wide by 3/12 inch projection.
D. Roller strike.
E. Key override cylinder to match typical locksets. Passage functions can be set by key inside.
F. Compatible with exit device when scheduled.
G. U.L. fire listed as accident – panic fire hardware.
H. Simplex-Unican 1000 series: www.kaba-ilco.com.

2.10 KEYING

A. Provide keying system as directed by the CONTRACTING OFFICER. The CONTRACTOR shall have a qualified representative of the hardware supplier available for the purpose of establishing Keyed Products.
B. Provide a master key system.
C. Provide 4 cut keys for each keyed different lock and cylinder.
D. Provide 6 cut keys for each keyed alike group.
E. Provide 6 cut keys of each master.
F. Provide interchangeable core construction keying. Only construction keys allowed during construction.
G. Stamp keys “DND”.

2.11 CLOSERS

A. UL IOC or NFPA 252 positive pressure fire listed cast iron shell with steel rack and pinion-piston type surface mount rectangular enclosure.

    1. Non-handed, field adjustable for interior and exterior doors to 48 inch wide.
    2. Rated for heavy duty high-use for door sizes indicated by manufacturer: LCN 4000, or Stanley QDC 100 series.

B. Adjustable closing speed, 3 second minimum from 70 degrees to 3 inches from

the latch for accessible use. Separate adjustable latching speed and separate adjustable back check.

C. 5-pound adjustable maximum opening pressure on interior non-fire rated doors.
D. Through mounting bolts with spacers or sex bolts and mounting bracket adaptors as necessary for door and frame conditions. Security screws into threaded backing.

    1. Special extra clearances mount arms so that weather seals and smoke seals are not cut and provide clearance for overhead stops and coordinators.

E. Fire resistant and low temperature fluid for satisfactory operation to 30 degrees F and no permanent damage if subjected to minus 30 degrees F.
F. Forged steel arm with spring stop, parallel arm and with accessories as required for mounting on room side of corridor doors and inside of exterior door.

2.12 DOOR KICK AND ARMOR PROTECTION PLATES

A. Stainless steel, at least 0.05 inch thick and 2 inches less than door width, or as required to fit door seals per ANSI A156.6.
B. Kick plates: 10 inches high.
C. Mop plates: 4 inches high.
D. Armor plates: 40 inches high.
E. When kick plate is scheduled together with armor plate, install kick plate on pull side. Kick plates, both sides sche4duled as”2 kick plates”.

2.13 PUSH PLATE

A. Satin finish stainless steel 15 inch by 6 inch by .050 inch cut out for cylinder where scheduled, beveled 4 sides with square corners per ANSI A156.6. Attachment screws to match plate finish.

2.14 PUSH BAR

A. 1 inch round solid stainless steel horizontal mount bar 90-degree end return 2 inch projection by 3-1/2 inch less than door width: per ANSI 156.6 type J501.

2.15 DOOR PULL

A. 1 inch round solid stainless-steel bar with 3-inch offset backset. 90-degree end return 2-1/4 inch projection by 12 inch center to center long through bolt per ANSI A156.6 type J401.

B. Mount on stainless steel 15 inch by 3 inch by 1/8 inch ANSI A156.6 plate. Cut out for cylinder where scheduled.

2.16 WALL DOOR STOPS (TYPICAL INTERIOR DOOR)

A. Provide for all interior doors, preventing knobs, lever handles and pulls from striking wall surfaces or other doors. Provide floor stops where wall stops not possible. Not required when overhead door stop scheduled.

1. Wall stops: 2-3/8 inch round resilient rubber: with metal mount screw attach: ANSI A156.16 grade 1, type L0210.
2. Concave wall stops where push-button locks are used.

B. Floor stops: Metal-rubber: dome type screw and peg attach: ANSI A156.16 Grade 1, Type L0214 as necessary for door and floor construction.

2.17 AUTOMATIC WALL DOOR HOLDERS

A. A. Wall surface screw mount spring loaded roller with rubber pad cushion. ANSI A156.16 Grade 1 Type L3129 Aluminum: IVES WS45 or equal.

2.18 DOOR SILENCERS (TYPICAL INTERIOR DOOR)

A. Rubber door bumpers silencers 3/8-inch diameter resilient rubber-for force fit into drilled hole per ANSI A156.16, Grade 1, Type L03011.

1. Provide 3 evenly spaced at each swing doorjamb steel frame. Not required on doors with seals or weather-strip.

2.19 THRESHOLDS

A. Exterior: Extruded aluminum full width single piece at exterior openings. 6 inch by 1/4 inch saddle with beveled edges and fluted top with integral plastic thermal barrier in accord with ANSI/BHMA A156.21, PEMKO 250 Series, Zero, Reese or equivalent.
B. Interior: Extruded beveled edge fluted aluminum full width single piece at fire-rated doors. 4-inch by 1/4 inch PEMKO 270, Zero, Reese, or equivalent. Not required at 20-minute doors. Use carpet separator threshold specified below where carpet occurs on both sides of door fire rated over 20-minutes, and at exterior vestibules.

1. Carpet Separator Threshold: Extruded aluminum full width single piece 4 inch wide by 7/16-inch-high saddle with fluted top in accord with ANSI/BHMA A156.21 J32140: PEMKO 230 Series or equivalent Zero or Reese.

2. Carpet-to-sheet flooring, carpet-to-concrete, and sheet flooring-to-concrete separator threshold: Extruded aluminum full width single piece 2 1/2 inch wide by 3/8-inch-high saddle with fluted top and offset in accord with ANSI/BHMA A156.21 J32180: PEMKO 170 Series or equivalent Zero or Reese.

C. Fasten thresholds with countersunk-head screws 12-inches spacing maximum: provide two screw rows for thresholds over 6-inches wide.

2.20 WEATHERSTRIPPING (TYPICAL AT EXTERIOR DOORS)

A. Dense layered plastic bristle brush weather strip. Brush fibers fused into place, flexible at minus -30 degrees F. held in extruded aluminum holder-mount with pre-punched pre-slotted holes for mounting with screws. Mount on inside warm face. ANSI and PEMKO Corporation numbers listed, equivalent Sealeze, or Zero acceptable.
B. Full-length single piece.
C. Door head and Side Jambs: 45-degree angle mount, 3/8-inch brush ANSI R3A36 PEMKO 45041.
D. Door Bottom: 1-inch brush; ANSI R3A415 PEMKO 181

2.21 SOUND SEALS

A. Continuous surface mount metal molding attachment, screw adjustable closed cell EPDM or neoprene sponge rubber insert seal. ICBO fire door approved.
B. Door head and side jams: PMKO 379.
C. Paired door meeting rails: PEMKO 351.

2.22 OVERHEAD DOOR STOP

A. Overhead with a separate check-stop and hold-open recommended for exterior heavy-duty use; stainless steel or chrome plated extruded bronze and brass 85 to 110 degrees opening; shock absorber: Corbin Russwin, Glynn Johnson, Rixon or equal. U.L. Labeled with no hold-open at fire doors.

2.23 FIRE DEPARTMENT KEY BOX

A. Hardened steel plate lockable key box approximately 6-inch W by 6-inch H by 4-inch D double entry lock, neoprene weather seal, black color: recessed wall mounted KNOX 3200 Series: www.knoxbox.com or equal as approved by Fire Department.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine the DRAWING details and field conditions for defects that will adversely affect the work, and for deviations beyond allowable tolerances.
B. Beginning of installation shall mean acceptance of the interfacing surfaces as capable of producing an acceptable job.

3.2 SOLID BACKING

A. Provide within structure and doors for hardware mounting, including wall doorstops and closers. Coordinate as required during construction. Provide special mounting accessories, built-in if required.

3.3 MOUNTING LOCATIONS

A. Per ANSI A117.1 – Accessible Buildings approved submittals, manufacturer's standard practice and coordinated with door and frame manufacturer.
B. Mount closers on interior side of exterior doors and on room side of corridor doors.
C. Mount resilient weatherstrip on inside of door assembly to form vapor retarder.
D. Other Mounting Shall Be As Follows:

1. Wall Doorstop: lockset handle to strike center of stop.
2. Exit Device Operating Bar: 37 inches from finished floor to center.
3. Push and Pull Bars: 42 inches from finished floor to center and 4-inch backset to center of push and pulls from door edge.

3.4 INSTALLATION

A. In accord with applicable ANSI standards, approved submittals, the manufacturer's written instructions and ADAG for the conditions of use. Install closers and closer arm with bolts through doors.
B. Do not install surface mounted items until finishes are completed on substrate. Coordinate as necessary. Remove hardware after fitting if necessary, for painting and reinstall.
C. Apply exterior hardware and thresholds with gaskets or in continuous silicone sealant bed. Do not cut weather seal at closers.

D. Electrical device installation:

1. Perform work in accord with National Electrical Code as amended locally using applicable portions of Division 16- Electrical.
2. Coordinate exact location for electrical power and control wiring connections.
3. Verify electrical power and control is operative.

3.5 FINAL ADJUSTMENT

A. Per manufacturer's written instructions, including, cleaning and lubrication to meet ADAG.
B. Adjust doors, compensating for completed, operating heating and vent system. Latches and bolts shall engage keepers in latched position and not rattle.
C. Doors with closers shall close and latch without assistance.
D. Doors shall open and close smoothly and easily with 1 hand. Weather seals smoke seals, and sound seals shall be in continuous contact in latched position.

3.6 CLEANING

A. Remove shipping labels and leave hardware surfaces clean.

3.7 TYPICAL HARDWARE SETS

A. Provide 1 set for each opening.
B. Provide items noted “TYPICAL” such as hinges, doorstops, seals and weatherstrips as specified under "PRODUCTS" for each set.

1. Provide unique items such as locksets and closers according to Door Hardware Schedule. ANSI A156.13 mortise locks lock functions listed.
    a. F01 "Passage" function: Latch bolt operated by lever from either side at all times.
    b. F04 (F40) “Office Entry” function: Latch bolt operated by lever either side except when outside lever is made inoperative by key outside or inside turn piece. When outside lever locked, latch bolt is retracted by Key outside or by operating lever inside. Auxiliary dead latch.
    c. F06 Holdback Lock function: Latch bolt operated by lever from either side except when outside lever is locked from outside by key. Latch bolt can be locked in a retracted position by key. When outside lever is locked, latch bolt is retracted by key from outside or by operating inside lever unless latch bolt has been locked in a retracted position. Auxiliary dead latch.

d. F07 [F86 bored] “Storeroom” function: Latch bolt operated key outside or by lever inside. Outside lever always inoperative. Auxiliary dead latch
e. F13 “Dorm” Function (Schlage L9456) Latch bolt operated by lever either side. Dead bolt thrown or retracted by key outside or inside turn piece. Inside lever simultaneously retracts deadbolt, latch bolt and unlocks outside lever.
f. F22 Similar “Privacy” function (Schlage L9496): Latch bolt operated by lever from either side except when locked by inside turn or button and by emergency key release from outside. Latched position displays “Occupied” sign plate outside.

C. Include any special maintenance adjustment tools necessary.
D. Refer to DRAWINGS for locations and details.

3.8 DOOR HARDWARE SCHEDULE

Hardware Set 1: Single – Exterior Entry Openings 101 and 101A
1 Lockset F06 – Office Function
1 Closer
1 Overhead Door Stop
1 Kickplate

Hardware Set 2: Single **-** Toilet Opening 104
1 Lockset, F22 – Privacy Function
1 Kickplate

Hardware Set 4: Single **-** Openings 103 Electrical, 105 Mechanical
1 Lockset F07 Storeroom Function
1 Closer
1 Kickplate

Hardware Set 6: Single – Office Opening 102
1 Lockset, F04 Entry Function
1 Kickplate
1 Floor or Wall Stop

NOTE: Hardware for overhead doors by door manufacturer.

END OF SECTION

SECTION 08 91 19
WALL LOUVERS

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Section 07 92 00 - Joint Sealants
B. Division 23 - Ductwork: Ductwork attachment to louver

1.2 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification. The publications may be referred to in the text by basic designation. In case of conflict the most stringent shall govern.

1. Air Movement and Control Association, Inc. (AMCA) AMCA 500 -Test Method for Louvers, Dampers, and Shutters.
2. ASTM A653- Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
3. ASTM B209 - Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
4. ANSI/ASTM B221 - Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

1.3 PERFORMANCE REQUIREMENTS

A. Recessed intermediate bracing for continuous exterior sloped horizontal louver appearance without visible intermediates or corner framing.
B. Installed louver to permit passage of air velocity of 900 feet per minute without blade vibration or noise, with maximum static pressure loss of 0.125 inches measured at 700 feet per minimum without birdscreen.
C. Fabricate louver to permit 47 percent minimum free area.
D. Structural wind pressure: 35 psf inward, 45 psf outward.

1.4 QUALITY ASSURANCE

A. Fabricator with at least 100 successful installations of AMCA certified louvers.

1.5 SUBMITTALS

A. Indicate elevations, field joints, dimensions, head, jamb, and sill details; blade configuration; screening; intermediate structural supports, drainage and installation.
B. Provide product data on louvers describing air flow design characteristics, maximum recommended air velocity, free area, materials, and finishes.
C. Submit two samples 4 by 4 inch in size illustrating finish and color of exterior finish.

1.6 COORDINATION

A. Coordinate work of this Section with installation of adjacent metal siding and curtain and window walls.
B. Coordinate work of this Section with mechanical ductwork.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to specified criteria:

1. Ruskin Manufacturing Inc., (816) 761-7476.
2. Construction Specialties, Inc., (888) 640-5566.
3. Industrial Louvers, Inc. (800) 328-3421.
4. Greenheck Fan, Inc (715) 359-6171.

B. Substitutions: Under provisions of Section 01 60 00 - Product Requirements.

2.2 MATERIALS

A. Aluminum: ANSI/ASTM B221, alloy, extruded shape.
B. Fasteners: Stainless steel.

2.3 BIRD SCREEN

A. Interwoven wire or expanded mesh of aluminum, 3/4-inch maximum openings.

2.4 FLASHINGS

A. Sheet aluminum .063 inch minimum thick, color to match louvers.

2.5 SEALANTS

A. Silicone type, specified in Section 07 92 00 - Joint Sealants.

2.6 FABRICATION

A. Factory preassembled.
B. Louver Size: 4 inches minimum deep through wall face.
C. Louver Blades: Aluminum, sloped; and spaced 5 inches maximum, 0.080 minimum thickness integral drainable waterstop grooves on blade, similar to Ruskin ELF series.
D. Louver Frame: Channel shape, welded corner joints, 0.080 minimum thickness.
E. Mullions: Concealed to fit louvers and frame and meet performance requirements.
F. Head, Jamb, and Sill Flashings: Break formed or extruded to required shape.
G. Screens: Permanently install screen mesh in frame; screw to louver frame.
H. Blank Out Sheeting: Same material as louver and frame .032-inch minimum aluminum.
I. Anchor fasteners: Stainless steel, ¼ inch minimum diameter.

2.7 FINISHES

A. Surfaces visible from exterior: screens, flashing, and blank out sheeting: Factory Kynar fluoropolymer factory finish in colors to match adjacent metal wall panels.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the DRAWINGS and verify that field conditions are ready to receive

work and opening dimensions are within tolerances.

B. Beginning of installation means acceptance of existing conditions.

3.2INSTALLATION

A. Install louver assembly in accordance with manufacturer's instructions and approved submittals.
B. Install louvers level and plumb.
C. Secure louvers in opening framing with concealed fasteners to meet wind pressure requirements, 18 inches maximum spacing.
D. Install flashings and align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.
E. Install bird screening to interior of louver.
F. Install perimeter sealant and backing rod in accordance with Section 07 92 00 - Joint Sealants.

END OF SECTION

SECTION 09 21 16
GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Section 06 10 00 - Rough Carpentry
B. Section 06 20 10 - Finish Carpentry and Architectural Woodwork
C. Section 07 21 10 - Building Insulation
D. Section 07 27 10 - Air and Water Barriers
E. Section 07 92 00 - Joint Sealants
F. Section 08 11 13 - Hollow Steel Doors and Frames
G. Section 08 31 00 - Access Doors
H. Section 08 71 10 - Door Hardware
I. Section 09 91 00 - Painting
J. Division 22 - Access Doors

1.2 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this Specification. The publications may be referred to in the text by basic designation only. In case of conflict only the most stringent shall apply.

1. ASTM A568 - Specifications for General Requirements for Steel, Sheet, Carbon and High Strength Low-Alloy, Hot-Rolled Sheet and Cold-Rolled Sheet.
2. ASTM A653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy - Coated (Galvanized) by the Hot-Dip Process.
3. ASTM A1003 - Specification for Steel Sheet, Carbon, Metallic and Nonmetallic - Coated for Cold-Formed Framing Members.
4. ANSI/ASTM C475 - Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
5. ANSI/ASTM C645 - Specification for Nonstructural Steel Framing Members.

6. ANSI/ASTM C754 - Specification for Installation of Framing Members to Receive Screw Attached Gypsum Board.
7. ASTM C834 - Specification for Latex Sealants.
8. ASTM C840 - Specification for Application and Finishing of Gypsum Board.
9. ASTM C841 - Standard Specification for Installation of Interior Lathing and Furring.
10. ASTM C919 - Practice for Use of Sealants in Acoustical Applications.
11. ASTM C954 - Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs 0.033 inches to 0.112 inches in Thickness.
12. ASTM C955 - Specification for Load-Bearing Steel Studs, Runners and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases.
13. ASTM C1002 - Specification for Steel Self-Piercing Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
14. ASTM C 1047 - Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
15. ASTM C1177 - Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
16. ASTM C1178 - Specification for Glass Mat Water-Resistant Gypsum Backing Board.
17. ASTM C1325 - Specification for Non-Asbestos Fiber-Mat Reinforced Cement Interior Substrate Sheets.
18. ASTM C1396 - Standard Specification for Gypsum Board.
19. ASTM C 1629 - Classification for Abuse Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels.
20. ASTM C 1658 - Specifications for Glass Mat Gypsum Panels
21. ASTM D 3273 - Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
22. ASTM D5420 - Test Methods for Impact Resistance of Flat, Rigid Plastic Specimen.
23. ASTM D5034 - Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test).
24. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
25. ANSI/ASTM E90 - Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
26. ANSI/ASTM E119 - Test Method for Fire Tests of Building Construction and Materials.
27. ASTM E695 - Test Method of Measuring Relative Resistance of Wall, Floor, and Roof Construction to Impact Loading.
28. ANSI A108.11 - Interior Installation of Cementitious Backer Units.
29. ANSI A118.9 - Standard for Test Methods and Specifications for Cementitious Backer Units.

30. Gypsum Association (GA) 201 - Using Gypsum Board for Walls and Ceilings.
31. GA 203 - Installation of Screw-Type Steel Framing Members to Receive Gypsum Board.
32. GA 214 - Recommended Levels of Gypsum Board Finish.
33. GA 216 - Specifications for the Application and Finishing of Gypsum Panel Products.
34. GA 219 - Instructions for Installation of Steel Door Frames in Steel Stud Gypsum Board Fire-Rated Partitions.
35. GA 600 - Fire Resistance Design Manual.
36. Underwriters Laboratories (UL) Listing and Fire Resistance Directory.

1.3 SUBMITTALS

A. Special details associated with fire rated assemblies, acoustic seal, control joints, deflection heads and trim.
B. Provide product data and installation instructions for metal framing, top track deflection framing, edge trim, and expansion and control joints and shaft wall.
C. Samples of proposed control joints, slot reveals, corner beads and wall top deflection heads.
D. Applicator experience: job descriptions, telephone number of owner or architect.

1.4 QUALITY ASSURANCE

A. Applicator: Company specializing in gypsum board systems with at least 25 jobs similar to this within the last 5 years.

1.5 REGULATORY REQUIREMENTS

A. Conform to IBC for fire rated assemblies: UL, Gypsum Association or ICC listed assemblies.
B. Conform to IBC for Steel Studs.

1.6 STORAGE AND HANDLING

A. Maintain gypsum wallboard above ground protected from weather and moisture.
B. Do not overload structure by storing concentrated stacks of gypsum wallboard.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Maintain work area, substrate and materials 55 to 85 degrees F, 70 percent maximum relative humidity for 48 hours prior to, during and 72 hours minimum after installation or until completely dry.
B. Provide adequate ventilation.
C. Provide lighting of 80-foot candles at work with explosion proof electrical fixtures. Building lights may be used.

PART 2 - PRODUCTS

2.1 FRAMING AND FURRING ACCESSORIES

A. ASTM C645 and GA 216: Bridging-bracing straps, angles, anchors, plates, brackets and the like shall be at least 20 gage galvanized sheet steel, matching studs and as recommended by the stud manufacturer.
B. Furring: ASTM C645, 20 gage galvanized sheet steel hat-shaped channel, or zee shaped 7/8-inch deep for screw attachment of wallboard. Clips, adjustable brackets, and other anchorage as necessary.
C. Carrying Channels: ASTM C645, 1-1/2 inch cold rolled steel, 16 gage (0.05 inch) thick minimum. Galvanized in accordance with ASTM A653.
D. Hanger Wire: Minimum 12 gage galvanized soft annealed steel.
E. Tie Wire: Minimum 16 gage galvanized soft annealed steel.

2.2 FASTENERS

A. Self-drilling, self tapping drywall and metal screws to penetrate framing and in accordance with ASTM C954 and GA 216. Only GWB screws in GWB, no nails allowed. Use hot-dip galvanized zinc coated or stainless screws in exterior walls, showers, tub enclosures, exterior entries, exterior sheathing and similar wet use areas.

    1. Length to penetrate GWB and backing.

B. Metal Studs to Runners, Furring Channels, and Other Metal Accessories: Self-drilling, self-tapping pan head type “S” screws in accord with ASTM C 954, size per metal stud manufacturer’s written instructions for specified fire resistance but not less than No.6: 3/8 inch long.

2.3 FRAMING ANCHORS

A. Standard commercial threaded expansion anchors: IBC approved and recommended for intended use by manufacturer may be used if approved by the CONTRACTING OFFICER. Submit manufacturer's literature indicating lateral (shear) and pullout (tension) data for approval.
B. Anchor diameter 1/4 inch minimum and 400-pound minimum average pullout. Length for 1-1/2 inch minimum embedment.
C. Each anchor shall be capable of developing at least 4 times design load in lateral (shear) and pullout (tension) loads into substrate, for condition of use.
D. Powder driven anchors not permitted for tension without IBC approval for condition of use.

2.4 GYPSUM BOARD (GWB)

A. Typical Interior Gypsum Board: ASTM C1396; fire resistive Type X 5/8 inch thick, edges tapered; ends square cut. Mold resistance 10 per ASTM 3273.
B. Water Resistant Gypsum Board: ASTM C1178; for use as backer under FRP in toilet and bath areas, fire resistive type X 5/8 inch thick, edge square paper free glass mat faced and moisture resistant core. Mold resistant 10 per ASTM D3273. Georgia-Pacific Corp "Dens-Shield", "Tile Backer" or approved.

2.5 SEALANT

A. Single component silicone for fire rated joints and penetrations in accordance with Section 07 84 00 – Firestopping.

2.6 ACOUSTICAL AND THERMAL INSULATION

A. As specified in Section 07 21 10 - Building Insulation.

2.7 ACOUSTICAL SEALANT

A. Single component non-hardening, latex base non-skinning per ASTM C834, for use in conjunction with gypsum board; manufactured by U.S.G. Company, W.W. Henry Co., Pecora, or approved.

2.8 CORNER BEADS

A. "L"-Shaped paper faced galvanized steel or zinc tape-on-type per ASTM

C1047 or GA 216.
B. Round Bullnose 3/4-inch paper faced galvanized steel or zinc tape-on-type.

2.9 EDGE TRIM

A. Paper faced galvanized steel or zinc “LC” – shaped 3/4-inch minimum leg tape-on type, without screws, per GA 216, or ASTM C1047.

2.10 CONTROL JOINTS

A. Galvanized steel or zinc 1/2-inch gap tape-on-type with masking strip removable after finishing per GA 216, or ASTM C1047.

2.11 JOINT COMPOUND AND JOINT TAPE

A. ASTM C475 and GA 216 compatible joint compound and adhesive, from a single manufacturer. Joint compound recommended in writing for additional mold resistance by manufacturer.

1. Use glass fiber tape with setting type compound in high moisture areas and with any glass fiber surfaced gypsum board.
2. Glass Fiber Tape: Alkali resistant open weave glass-mesh fabric: 4 ounce per square yard minimum weight.

B. Use latex thin-set adhesive and fiberglass tape for cement board joints. Seal cement board exposed surfaces and finish as recommended by board manufacturer.

2.12 ANCHORAGE BACKING FOR WALL MOUNTED ACCESSORIES

A. Minimum 16 gage sheet steel by 6 inches wide by length required and across 3 studs minimum.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the DRAWING details and verify field conditions for defects that will adversely affect the work, and for deviations beyond allowable tolerances.
B. Other work shall be substantially complete behind wall studs and above ceilings prior to start of GWB work particularly mechanical, electrical,

structural, fire spray and insulation.

C. Start of installation shall mean acceptance of the existing conditions as capable of producing an acceptable job.

3.2 GENERAL SYSTEMS INSTALLATION

A. Per manufacturer's written instructions, referenced publications and IBC.
B. Do not install interior products until installation area is enclosed and heated.

3.3 CEILING AND SOFFIT FRAMING INSTALLATION

A. Install in accordance with ANSI/ASTM C754, ASTM C645, GA 201 and IBC Chapter 25.
B. Either studs or wire hangers are acceptable for ceiling support.
C. Attach each hanger wire, stud track, and brace to structure with IBC approved anchors. Coordinate and supply embedded hangers or inserts into structure as needed.
D. Ceiling studs (studs not touching floor) and joists shall be 24 inches on center maximum.

    1. Install ceiling stud with 45 degrees brace studs to structure deck above 6 feet maximum on center on opposite sides of ceiling assemblies.

E. Position hanger wires for the load supported and in accord with ASTM C754 and GA 201 and four feet maximum spacing. Coordinate location to avoid other work with 6-inch minimum space.
F. Space carrying channels 4 feet maximum and within 6 inches of walls. Lap channels splices 2 feet and secure each end with double strand tie wire.
G. Provide hangers at ends of each runner and carrying channel 6-inch maximum from ends.
H. Do not slope hangers over one inch in 6 inches horizontal unless equal counter-sloping hangers are provided.
I. Provide a trapeze or equivalent device where obstructions prevent direct suspension. Minimum trapeze bar: two carrying channels wire tied together.
J. Wrap end of hanger wires 3 full turns in 3 inches at connections and loop tightly to prevent vertical movement or rotation of member.

K. Adjust hanger wires taught: do not kink or bend hanger wire to level ceiling.
L. Provide two extra hanger wires above opposite edges of gypsum ceiling mounted air duct outlets and light fixtures for attachment by duct and light installers.

3.4SEALANT INSTALLATION

A. Apply sealants in accord with Section 07 92 00 - Joint Sealants.
B. Install acoustical sealant continuously at gypsum board perimeter in accord with ASTM C919 at:

    1. Metal Framing: track, header, and jamb intersect.
    2. Base Layer of double layer systems.

C. Seal penetrations of gypsum fire rated assemblies by conduit, pipe, ductwork, rough-in boxes, and hardware with silicone sealant firestopping systems in accord with Section 07 84 00 - Firestopping. Seal acoustic-sound rated assemblies with acoustical sealant.

3.5GYPSUM BOARD INSTALLATION

A. Install GWB in accordance with ASTM C840, and GA 216 and manufacturer's instructions to meet fire resistance indicated. Extend gypsum board continuously into and behind recessed wall mounted accessories such as fire extinguishers and toilet accessories in fire resistance rated walls.

    1. Verify insulation and vapor retarder is installed and approved before installing GWB.

B. Cut GWB neatly to fit in moderate contact and neatly against adjacent GWB. Cut around penetrations for 1/4 to 1/2-inch space between gypsum and penetration. Bevel untapered panel edges approximately 1/8 inch at a 45 degrees angle using a sharp utility knife. Peel back and remove any loose facing from the edges.
C. Install lead edge of GWB to open end of stud flanges first. Stagger joints on opposite side of wall studs by one stud minimum.
D. Use screws for fastening gypsum board: 8 inches maximum spacing over backing. Drive screws flush. Use appropriate short screws on resilient furring channels to avoid penetrating support.
E. Use corrosion resistant screws in showers, exterior entries and any similar wet use areas.

F. Multi-Layer Applications: Gypsum backing board allowed for first layer, placed perpendicular to framing or furring members. Place second layer perpendicular to first layer. Offset joints of second layer from joints of first layer by one stud space.
G. Use the longest practical GWB panel lengths. Keep butt end joints to a minimum.

3.6 CONTROL JOINT INSTALLATION

A. Install control joints parallel with lines of building spaces where substrate joints such as seismic joints or material changes occur and in uninterrupted gypsum board or cement board spaces: 30 feet maximum for walls and 900 square feet total area between control joints.
B. Install control joints in line with jamb edge of door openings over 10 feet wide.

3.7 GYPSUM EDGE TREATMENT

A. Treat cut edges and holes in water resistant gypsum board with manufacturer recommended sealer.
B. Place corner beads at external corners. Use longest practical length.
C. Place edge trim where gypsum board abuts dissimilar materials and where gypsum ends are exposed to view.

3.8 JOINT AND SURFACE TREATMENT

A. Embed tape at GWB joints and interior angles with joint finishing compound in accord with ASTM C840, and GA 216. Fill and smooth exposed joints, edges, and depressions to produce a smooth flush surface ready to receive finishes specified in accordance with manufacturer's instructions.

    1. Use setting type joint compound with fiberglass tape for fiberglass faced gypsum board.
    2. Allow sufficient drying time between coats to obtain a moisture content of 12 percent or less on GWB and joints.
    3. No heavy texture permitted.

B. Smoothly feather joint compound coats onto adjoining surfaces.
C. Finish joints to a width at least 6 inches each side.
D. Levels of Surface Treatment in accord with ASTM C840 and GA214:

1. Non-exposed areas, as above suspended ceilings: Level 2: Embed tape at joints and apply joint compound over fasteners and trim.
2. Boiler, Janitor, and Mechanical-Electrical Rooms: Level 3: Embed tape and apply two separate coats of joint compound over joints, fasteners. Joint compound shall be smooth and free of tool marks and ridges.
3. Walls and Ceilings with Paint Finish: Level 4: Apply two separate coats of joint compound over the taped joints. Cover fasteners, metal corner bead and trim with three separate coats and as smooth as possible to minimize sanding. Sand any excess joint compound free from lap marks, tool marks, crowned joints, and ridges. Fill scratches, craters and nicks with joint compound.
4. Joints and fasteners behind any tile and fiber reinforced plastic panels: Level 2: Tape and fill and sand lightly to even surface.

E. Use sandpaper or abrasive-mesh cloth with grit as fine as practical.
F. Remove sanding dust with a damp rag before recoating.

3.9 GWB AND GWB STUD FRAMING TOLERANCES (NON-CUMULATIVE)

A. To Subfloor: 1/4 to 1/2 inch space. Smooth without abrupt changes. Space around Mechanical, Electrical, and Other Penetrations: 1/4 to 1/2 inch before sealing.
B. Bowing or Warping from Proper Plane: plus minus 1/8 inch in 10 feet.
C. Joint Surface Alignment Before Taping: flush surfaces plus or minus 1/16 inch.
D. Joint Spacing Before Taping: 1/16 to 1/8 inch.
E. Gaps Between Perimeter Edge Trim Molding and Abutting Surfaces: 1/8 inch maximum with no abrupt changes.
F. Exposed Surface Texture: Smooth without texture, pock holes, or scratches over 1/64 inches within any 2 square feet.

3.10 CLEANING

A. After final taping and sanding, lightly wipe GWB surfaces with a damp rag to remove dust and dirt.
B. Leave in condition to receive primer - sealer.

3.11 SCHEDULE

A. Follow finish schedule and details on DRAWINGS.
B. Use typical GWB unless otherwise indicated. First layer of multi thicknesses may be gypsum backing board.
C. Use water resistant GWB on toilet and shower room walls behind fiber reinforced plastic-coated panels.

END OF SECTION

SECTION 09 65 00
RESILIENT FLOORING

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Section 06 10 00 - Rough Carpentry
B. Section 06 20 10 - Finish Carpentry and Architectural Woodwork
C. Section 07 18 13 – Pedestrian Traffic Coating

1.2 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this Specification. The publications may be referred to in the text by basic designation only. In case of conflict only the most stringent shall apply. No Asbestos Based Products allowed.

1. Federal Specification (FS) FF SS-T-312 – Tile, Floor, Asphalt, Rubber, Vinyl-Composition.
2. FS-L-F-475 - Floor Covering, Vinyl, Surface, (Tile and Roll), with Backing.
3. FS SS-W-40 - Wall Base: Rubber and Vinyl Plastic.
4. ASTM D471-Test Method for Rubber Property—Effect of Liquids.
5. ASTM D1894 – Test Method for Static and Kinetic Coefficients of Plastic Film and Sheeting.
6. ASTM D2047 - Test Method for Static Coefficient of Polish-Coated Floor Surfaces as Measured by the James Machine.
7. ASTM D 2240-Test Method for Rubber Property Durometer Hardness.
8. ASTM D3389 – Test Method for Coated Fabrics Abrasion Resistance.
9. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
10. ASTM E648 - Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.

11. ASTM E662 - Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
12. ASTM F150 – Test Method for Electrical Resistance of Conductive Resilient Flooring.
13. ASTM F710 – Practice for Preparing Concrete Floors to Receive Resilient Flooring.
14. ASTM F 925 – Test Method for Resistance to Chemicals of Resilient Flooring.
15. ASTM F970 – Test Method for Static Load Limit.
16. ASTM F1066 – Specification for Vinyl Composition Floor Tile.
17. ASTM F1303 - Specification for Sheet Vinyl Floor Covering with Backing.
18. ASTM F1344 – Specification for Rubber Floor Tile.
19. ASTM F1516 – Practice for Sealing Seams of Resilient Flooring Products by the Heat Weld Method.
20. ASTM F1700 –Solid Vinyl Floor Tile.
21. ASTM F1861 – Resilient Wall Base.
22. ASTM F1859 – Rubber Sheet Floor Covering Without Backing.
23. ASTM F1869 – Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
24. ASTM F1913 –Vinyl Sheet Floor Covering Without Backing.
25. ASTM F2034 – Specification for Sheet Linoleum Floor Covering
26. ASTM F2169 –Resilient Stair Treads.
27. U.S. Department of Commerce (DOC): FF-1-70-Fire Spread Flammability Pill Test.
28. ASTM F2170 – Test Method for Determining Relative Humidity in Concrete Floor Slabs using In-Situ Probes.
29. ASTM F3010 – Practice for Two Component Resin based Membrane-Forming Mitigation Systems for Use Under Resilient Flooring.
30. IBC 2018, 804 – Interior Floor Finish: NFPA 253 – Test Method for Critical Flux of Floor Covering Systems.

1.3SUBMITTALS

A. Manufacturers Literature:

1. Material Composition.
2. Installation Instructions and Specifications to be used on this job, including floor preparation, floor manufacturer approved adhesives and seam locations, edge trim and expansion joint trim.

B. Samples:

1. 6 by 6 inch of full range of manufacturers standard color - texture available for selection.

C. Written verification of manufacturer and installer qualifications with job experience names, addresses and telephone numbers.
D. Maintenance manuals: flooring manufacturer's instructions for cleaning and maintenance.
E. Shop drawings, showing the locations of seams and edge trim strips and different color or flooring type on a floor plan.
F. Warranty.
G. Certification: Manufacturers Certification on manufacturer's letterhead, signed by the CONTRACTOR that the flooring:

1. Meets these specifications and conforms to submitted literature.
2. Conforms to specified fire hazard properties.
3. Is recommended for heavy public traffic in corridors offices, classrooms, and patient rooms.

1.4MANUFACTURER QUALIFICATIONS

A. Manufacturer shall have been manufacturing commercial grade flooring for at least 25 similar successful jobs, and manufactured the flooring proposed for this job for the last 2 years.
B. List 5 jobs with similar traffic use in which the proposed flooring has been installed for at least 2 years. Include Owner Representatives Names, Address, and Phone Number for reference.

1.5 INSTALLER QUALIFICATIONS

A. Installer shall have successfully completed at least 5 jobs of similar size and complexity in the past 5 years.

1.6 REMOVAL AND INSTALLATION OF LOOSE EUIPMENT AND FURNITURE

A. OWNER will remove, relocate and replace existing furniture to allow flooring installation continuous underneath.

1.7 PRE-INSTALLATION CONFERENCE

A. Arrange a Pre-Installation Conference held at the job site on the first day of installation.

   1. Attendance required for:

      a. Flooring Installer
      b. OWNER Representative

1.8 INSTALLATION QUALITY CONTROL

A. First 150 square feet of flooring installed and approved by the OWNER shall be the standard for the rest of the installation, including seams, bases, transition, floor preparation and adhesives.

1.9 INDOOR AIR QUALITY

A. The Owner is concerned about indoor air quality and chemical emissions.
B. Verify building ventilation system is in proper working order. Operate building permanent ventilation system at maximum outdoor air flow before applying adhesives, during installation and minimum 72 hours after installation.

1.10 TEMPERATURE AND HUMIDITY REQUIREMENTS

A. Maintain building and materials including subfloor at 65 to 75 degrees Fahrenheit and 20 to 50 percent relative humidity for 72 hours prior to, during and maintain 60 degrees Fahrenheit after installation.

1.11 EXTRA MATERIALS

A. Not less than 25 square feet of extra flooring material in full roll width for sheet goods and full tiles for tile of each type and color pattern used in the work for subsequent repair and maintenance by the OWNER.
B. Label each piece indicating manufacturer, stock number and location in completed work. Deliver to OWNER at job site.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturer names, numbers and features are listed to establish a standard of quality. Products may be provided from manufacturers with equivalent features and colors subject to meeting specified criteria.
B. Refer to Finish Schedule for basis of design information.

2.2 HAZARD CLASSIFICATION

A. IBC 804: NFPA 253, Class I, 0.45 watts/CM^2 or greater.
B. No Asbestos based materials allowed.

2.3 LINOLEUM - SHEET

A. Homogeneous mixture of linseed oil, tree resin, wood flour, limestone and color pigments calendered onto jute fabric backing per ASTM F2034. Recommended by manufacturer for commercial office and school use.

    1. Recommended load limit: 250 psi long term in accord with F970.
    2. Minimum sheet width: 6 feet.
    3. Thickness: 0.100-inch (2.5 mm) sheet and 0.080-inch (2.0 minimum) tile.
    4. Coefficient of friction: 0.6 minimum in accord with ASTM D1894 or ASTM D2047.

B. Pattern and Color: Equivalent to Forbo “Marmoleum” sheet.

2.4 WALL BASE

A. Thermoset (TS) vulcanized rubber top-set toe cove in accord with ASTM F1861.
B. 1/8-inch minimum thickness by height indicated on DRAWINGS or 4-inch minimum height. 4 feet minimum lengths.
C. 10 percent natural rubber, PVC free.
D. Provide minimum of 6 different standards through colors black, gray, blue, tan and brown for selection. Two colors will be used.
E. Vented base specified in Section 09 65 10 Resilient Multipurpose Flooring.

2.5 UNDERLAYMENT BOARD (on wood subfloor)

A. Plywood, 1/4-inch minimum thick APA grade “Underlayment,” hardwood plywood fully sanded face manufacturer recommended for use as resilient flooring underlayment and cement board as approved by resilient floor manufacturer: Columbia “Multiply”, Hardie “Hardibacker”, or Halex.
B. Install with galvanized or stainless-steel screws in bed of adhesive.

2.6 ADHESIVES, SEAM SEALERS AND ACCESSORIES

A. Waterproof type adhesives, seam sealers, heat weld rods, primers, cove strips, cap strips, and sub floor fillers: Type and brands as recommended in writing by flooring manufacturer for the conditions of installation.
B. Certify solvent free, low chemical emission and low Volatile Organic Compound (V.O.C.).

2.7 EDGE TRIM

A. Extruded mill finish aluminum, 2-1/2 inch by 3/8-inch one-piece PEMKO 174 or 236 to fit over flooring.

    1. Counter sunk drilled expansion screw fasteners 12 inch on center.

2.8 BASE CAP - FOR SELF COVED EDGES

A. “J” shaped chrome or stainless steel coved base cap, sized as

recommended by flooring manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces and the DRAWING details to receive flooring for defects that will adversely affect the work and for deviations beyond allowable tolerances.
B. Verify that subfloor is adequately dry and cured in accord with finish flooring manufacturer's recommendations: Cure concrete 90 days minimum with 50 to 85 degree Fahrenheit temperature, free of oil and curing agents.
C. Moisture Tests for Concrete Floors on Ground: Perform a minimum of three Calcium chloride tests per ASTM F1869 or drilled probe tests per ASTM 2170 for verification of concrete dryness. Test Probes: Transmex (www.tramexmeters.com) or equal.

    1. Apply concrete moisture suppression system if necessary to reduce moisture transmission to flooring manufacturer's installation requirements.
    2. Test before and after application of suppression system.

D. Enclose work area to contain dust. Verify building permanent ventilation system is operating.
E. Start of work shall mean acceptance of interfacing surfaces as capable of producing acceptable work.

3.2 INSTALLATION

A. Install in accord with flooring manufacturer's instructions, approved submittals, using approved application materials including primers, fillers, underlayments, adhesives and seam fusion solvents.
B. Flooring and Treads: Smooth and level without blisters or waves and with tight, abutting, adhered joints:

    1. Remove any adhesive, which dries or films over before flooring placement and replace with fresh, workable adhesive.
    2. Continuously seal sheet flooring seams by heat welding per ASTM F1516 or permanent chemical bonding recommended by sheet manufacturer.
    3. Apply shaped cove strips under self-cove sheet flooring base.

4. Apply j-cap to top of self-cove flooring base.

C. Pattern-sheet layout: start at center of floor space so that perimeter pieces are at least 1/2 width, except in irregularly shaped areas.

1. Lay tile with grain direction alternating in adjacent tiles.
2. Layout sheet flooring for minimum number of seams with seams out of traffic, and for pattern match.
    a. Install sheet flooring integral self cove up wall with radiused floor to wall cove shape and filler with metal top edge J trim where scheduled.
    b. Install flooring seams at least six inches away from parallel substrate joints.
3. Fit flooring neatly around recesses, penetrations, and permanent equipment, under edge strips, thresholds, and bases.
4. Install feature strips where indicated.

3.3EDGE TRIM STRIP INSTALLATION

A. Install over flooring edges at junctions with different type flooring materials and other exposed edges where flooring does not abutt a vertical surface.

1. Place directly under doors where joint occurs in doorway.
2. Not required where door threshold is installed over edge of flooring.
3. Anchor with screws, expansion anchor type for concrete, 12 inches maximum spacing, adhesive not acceptable.

3.4CLEAN UP

A. Remove surplus materials, adhesive, and installation compounds from flooring and adjacent materials caused by resilient flooring installation.
B. Leave completed flooring clean and buffed, ready for use.

3.5PROTECTION

A. Prevent rolling traffic for at least 48 hours after installation.
B. Provide plywood protection when moving heavy fixtures over flooring.

3.6 FINISHED TOLERANCES (NON-CUMULATIVE)

A. Abutting Joints: 1/64-inch maximum space.
B. Seams and Joints: Flush with completed surface.
C. Flat even Surface: 1/8 to 1/4 inch gap measured anywhere with a 10-foot straightedge.

END OF SECTION

SECTION 09 91 00
PAINTING

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Section 05 12 00 - Structural and Miscellaneous Steel: Shop Primed and Galvanized Items
B. Section 06 20 10 - Finish Carpentry and Architectural Woodwork
C. Section 06 41 16 - Laminate Faced Cabinets
D. Section 06 64 10 - Fiber Reinforced Plastic Paneling
E. Section 07 63 10 - Flashing and Trim
F. Section 07 92 00 - Joint Sealants
G. Section 08 11 10 - Hollow Steel Doors and Frames
H. Section 09 21 16 - Gypsum Board Assemblies

1.2 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this Specification. Publications may be referenced in the text by basic designation only. In case of conflict the most stringent apply.

1. ASTM D16 – Standard Terminology for Paint Related Coatings, Materials, and Applications.
2. ASTM D610 – Practice for Evaluating Degree of Rusting on Painted Steel Surfaces.
3. ASTM D714 – Test Method for Evaluating Degree of Blistering of Paints.
4. ASTM D 2485 – Test Methods of Evaluating Coatings for High Temperature Service.
5. ASTM D2486 – Test Method for Scrub Resistance of Wall Paints
6. ASTM D3359 – Standard Test Methods for Measuring Adhesion by Tape Test.
7. ASTM D4060 – Test Method for Abrasion Resistance of Organic Coating by the Taber Abraser.
8. ASTM D4442 - Test Method for Direct Moisture Content Measurement of Wood and Wood-Base Materials
9. ASTM D4541 – Test Method for Pull-Off Strength of Coatings Using Portable Adhesion-Testers.
10. ASTM D5894 – Practice for Cyclic Salt Fog/UV Exposure of painted Metal.
11. ASTM D6677 – Standard Test Method for Evaluating Adhesion by Knife.
12. Society for Protective Coatings/Steel Structures Painting Council (SSPC) - Standards and Specifications.

    a. SSPC-SP 1 – Solvent Cleaning.
    b. SSPC-SP 2 – Hand Tool Cleaning.
    c. SSPC-SP 3 – Power Tool Cleaning.
    d. SSPC-SP5/NACE No. 1, White Metal Blast Cleaning.
    e. SSPC-SP6/NACE No. 3, Commercial Blast Cleaning.
    f. SSPC-SP7/NACE No. 4, Brush-Off Blast Cleaning.
    g. SSPC-SP10/NACE No. 2, Near-White Blast Cleaning.

h. SSPC-SP11, Power Tool Cleaning to Bare Metal.
i. SSPC-SP12/NACE No. 5, Surface Preparation and Cleaning of Metals by Waterjetting Prior to Recoating.
j. SSPC-SP13/NACE No. 6, Surface Preparation for Concrete.

1.3DEFINITIONS

A. Conform to ASTM D16 for interpretation of terms used in this section.

1.4SUBMITTALS

A. Provide product data on all coating and finishing products; indicating application instructions including: surface preparation, undercoating, reducing, and certification that product is “Best Line - Premium Grade”.
B. Submit full range deep tone colors, pastel colors, and stains available from an acceptable paint manufacturer for selection of samples.
C. Submit sample 1 by 2-inch minimum size illustrating range of colors and texture available for each surface-finishing product.
D. Submit samples of selected colors representative of actual work as follows:

1. Minimum size: 3 by 3-inches.
2. Stain Colors: prepare on wood complete with transparent topcoat if scheduled.
3. Approved samples shall become final criteria for evaluating color and appearance of completed work.
4. One set of approved samples shall be kept on the job.
5. Identify each sample as to finish, formula, color name, and number.

E. Submit manufacturer and applicator experience data with project owner phone numbers.
F. Submit V.O.C. compliance certificate.

1.5QUALITY ASSURANCE

A. Product Manufacturer: Company specializing in manufacturing paint and coating finish products with 25 jobs similar in scope to work proposed.
B. Applicator: Specializing in commercial painting and coating application with at least 10 successful jobs similar to that proposed.
C. Verify coating thickness per manufacturers' instructions using an approved dry film coating testing instrument.

    1. Make 5 separate spot measurements where directed with 3 gage readings made for each location.
    2. The average of 5 spot measurements shall not be less than the specified thickness.

D. Paint applicator shall certify the following:

    1. Immediately before painting, surfaces conformed to the specified preparation; they were in the specified condition; and were clean, dry, and free of dust, rust, and mill scale to the degree required by this Specification.
    2. Surface preparation and coating use, mixing, application, and curing were done in accordance with the current printed instructions and instructions of the coating manufacturer, and these Specifications.
    3. The products specified were used or a listing of the names of the products used and their manufacturer was submitted and approved.

4. The products were used within the shelf-life dates of each container of each product used.
5. The manufacturer's recommended dry film thickness of coatings on the work.
6. Compatible paints were used where coatings are applied over previously applied coatings.

1.6 INDOOR AIR QUALITY

A. Before painting inside building operate building permanent ventilation system at maximum outdoor airflow before mixing and applying paint, and for minimum 72 hours after application.

1.7 REGULATORY REQUIREMENTS

A. Conform to International Building Code (IBC) for flame, fuel, smoke-rating requirements for completed finishes.

1.8 DELIVERY, STORAGE AND HANDLING

A. Store and protect products as recommended by paint manufacturer.
B. Deliver products to site in sealed and labeled containers.
C. Container labeling shall include manufacturer's name, type of paint, brand name, manufacture data, coverage, surface preparation, drying time, cleanup, color designation, and instructions for mixing and reducing.
D. Store paint materials at ambient temperature of 45 degrees F to 90 degrees F in well ventilated area, unless required otherwise by manufacturer's instructions. Only materials to be consumed within a 24-hour work period

allowed at work site.

E. Take precautionary measures to prevent fire hazards and spontaneous combustion.

1.9 TEMPERATURE AND HUMIDITY REQUIREMENTS

A. Provide continuous ventilation and heating equipment to maintain paint products and substrate dry and at ambient temperatures between 50 and 85 degrees F. for 24 hours before, during and 48 hours after application of finishes, unless permitted otherwise by coating manufacturer's recommendations.

1. Provide temperatures by temporary scaffold enclosures and heating as necessary.

B. Do not apply exterior coatings during rain or snow, or when relative humidity is above 65 percent, unless permitted otherwise by coating manufacturer's recommendations.
C. Provide lighting of 80 feet candles at work. Building lights may be used.

1.10 EXTRA MATERIALS

A. Provide a one-gallon container of each color used to OWNER for repair touch up.
B. Label each container with color, texture and building locations, in addition to the manufacturer's label.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Companies meeting the "Quality Assurance" criteria and these specifications.

2.2 MATERIALS – AIR QUALITY

A. Conform to governing regulations including Federal and State requirements

for pollution, safety and health. Maximum chemical pollutant emission volatile organic compounds (V.O.C.) for paints per USGBC LEED requirements.

2.3PAINT MATERIALS

A. Provide compatible products in accordance with approved paint manufacturer including paint, varnish, stain, enamel, lacquer, fillers and related products for prime, intermediate and finish coats.
B. Accessory material not specifically indicated, but required, such as shellac, reducers, undercoats, primers, putty and the like, shall be of quality not less than required by applicable Specification Standards and recommended by the finish coat manufacturer in writing for compatibility and conditions of use.
C. Paints containing lead shall not be used.
D. All products “Best Line - PREMIUM GRADE” for professional trade sales recommended by paint manufacturer for the conditions of use.
E. Mixing

    1. Furnish ready-mixed products except as otherwise specified.
    2. Follow manufacturer’s directions for:

a. Field-mixing of pastes and powders.
b. Field-catalyzing components.

3. Coatings shall have good flowing application properties, capable of drying, or curing free of streaks or sags and yielding finish specified.

2.4 DEEP TONE COLORS

A. Deep tone colors will be required for 20 percent of the work.
B. A maximum of 15 different shades or tints of color will be selected for use in the job.

2.5 FINISHES

A. Refer to schedule at end of specification for surface finishes.

PART 3 - EXECUTION

3.1 GENERAL

A. Coordinate time and areas of work with OWNER. Allow for building occupancy during work.

3.2 EXAMINATION

A. Verify that surface and substrate conditions are ready to receive work as specified and as recommended by the paint manufacturer. Report any conditions that may adversely affect proper paint application.

B. Examine DRAWINGS, SPECIFICATIONS, and field conditions to determine extent of exposed piping, ducts, conduit, electrical controls, cabinets and equipment and allow for painting as required.
C. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:

1. Gypsum Wallboard: 12 percent.
2. Concrete Plaster and Concrete Masonry Walls: 12 percent and minimum 45 days at 55 to 85 degrees F. curing.
3. Concrete Floors: minimum dry condition 60 days. Conform to coating manufacturer moisture requirements.
4. Interior Located Wood: 7 percent, measured in accordance with ASTM D4442.
5. Exterior Located Wood: 12 percent, measured in accordance with ASTM D4442. Minimum 36 hours after any water pressure washing.

D. Beginning of application means acceptance of existing surfaces.

3.3 PROTECTION

A. Protect elements surrounding the work of this section from damage or disfiguration.
B. Mask and shut down heat and ventilation intakes when painting adjacent exterior surfaces.
C. Repair damage to other surfaces caused by work of this Section.
D. Furnish drop cloths, shields, and protective methods to prevent spray or droppings from disfiguring other surfaces.

E. Protection of work when stopping for the day:

1. Erect barriers and post warning signs. Confirm that no dust generating activities will follow shutting down for the day.

3.4ITEMS NOT TO BE PAINTED

A. The following items shall be masked and not painted unless specifically scheduled:

1. Items with factory finish paint, such as light fixtures, toilet partitions, factory finished wall and soffit panels, vinyl wall coverings, and acoustical ceilings.
2. Concealed areas such as pipe chases and areas above finish ceilings.
3. Finished surfaces such as hardware trim, anodized aluminum, glass, stainless steel, bronze and the like.
4. Moving equipment wearing surfaces.
5. Equipment data plates, manufacturer's permanent maintenance labels and fire door and jamb labels.

3.5PREPARATION

A. General: Clean and prepare substrate for finish as specified and as recommended by coating manufacturer for conditions of use.
B. Coordinate with OWNER for areas which cannot use water or blast cleaning.
C. Remove or coordinate and have removed electrical plates, hardware, glazing stops, light fixture trim, and fittings prior to preparing surfaces and finishing. Replace removed items after painting.

D. Clean surfaces and correct surface defects.

1. Remove oil-grease and mildew with detergent or SSPC-SP1 cleaning solvent first (do not use paint thinner, hydrocarbons, or turpentine as they leave residue).
2. Remove dirt, dust, loose material, rust-scale, oil-grease, mildew, release agents, non-adhering paint by grit blast, pressure water blast, sand papering, grinding, scraping or wire brushing.
3. Sand paper thick and sharp edges of shop and existing paint and runs to smooth featheredge.
4. Lightly sand or abrade surfaces dull to insure adhesion.
5. Fill or sand out cracks, holes, pits and scratches, smooth to match adjacent finish.
6. Remove sanding dust prior to painting.

E. Seal stain marks, which may bleed through subsequent, finishes.
F. Existing coating to be re-painted or finished: remove loose, blistered, scratched, corroded finish, scaled or crazed finish to base material surface or feather edges smooth. Where new work joins existing work, prepare existing surfaces extending to the nearest break in the plane intersecting wall, ceiling or pilaster.
G. Impervious Surfaces: Remove mildew by scrubbing with solution of T.S.P. or 3 parts water to 1 part household bleach. Rinse with clean water and allow surface to dry.
H. Aluminum Surfaces Scheduled for Coating: Remove surface contamination by solvent cleaning. Remove oxidation with acid etch followed by solvent washing. Apply primer immediately following cleaning.
I. Insulated Coverings: Remove dirt, grease, and oil from cloth jacketing.

J. Copper Surfaces Scheduled for a Paint Finish: Remove contamination by steam, high-pressure water, or solvent washing. Apply vinyl etch primer immediately following cleaning.
K. Gypsum Board: Surfaces shall be clean, crack-free, joints finished, textured where specified prior to painting.

    1. If surface defects appear after prime coating, repair defects.

L. Existing Gypsum Board Surfaces: Clean, then latex fill and smooth defects up to 2-inch holes flush with adjacent surface and match existing texture. Sand to feather edge. Spot prime defects after repair.
M. Galvanized Surfaces: Remove surfaces contamination and oils per SPC SP1 solvent cleaning and thoroughly rinse. Remove sheen per SPC SP2, hand tool cleaning, or SSPC-SP4 brush-off blast cleaning. After cleaning, and prior to painting, remove dust and similar containments by air blast or vacuum. Apply primer immediately after cleaning.
N. Uncoated Steel and Iron Surfaces: remove grease, scale, dirt and rust per SSPC-SP1, Solvent Cleaning. Clean per SSPC-SP3 power tool cleaning, or SSPC-SP2 hand cleaning, or SSPC-SP4 brush-off blast cleaning.
O. Shop Primed Steel Surfaces: Solvent clean per SSPC-SP1 followed by sanding, scraping and wire brushing per SSPC-SP2 hand cleaning or SP7 brush-off blast cleaning to remove loose, scratched or weathered-corroded shop finish primer weld burns and rust. Feather edges to make inconspicuous. After cleaning and prior to painting remove dust and similar containments by air blast or vacuum.
P. Interior Wood Scheduled to Receive Paint Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats.
Q. Wood to Receive Stain or Transparent Finish: Remove dust, grit, and foreign

matter. Apply stain to ends and edges prior to installation.

R. Exterior Wood Scheduled to Receive Paint Finish: Remove dust, grit, and foreign matter. Apply back prime prior to wood installation. Seal knots, pitch streaks and sappy sections.
S. Glue Laminated Beams and Columns: Prior to finishing, wipe surfaces with solvent, remove grease and dirt then sand lightly.
T. Doors Scheduled for Painting: Paint top and bottom edges with paint after door fitting.
U. Wood Doors Scheduled for Transparent Finish: Seal top and bottom edges with clear varnish or lacquer after door fitting.

3.6APPLICATION

A. Apply coatings to all visible exposed surfaces scheduled in accordance with approved coating manufacturer's instructions and approved submittals for the conditions of use.
B. Do not apply finishes to surfaces that are not clean, dull, and dry.
C. Apply each coat to uniform finish.
D. Sand or abrade lightly and clean between coats to achieve adhesion if recommended by coating manufacturer.
E. Allow applied coat to dry before next coat is applied.
F. Where clear finishes are required tint fillers to match wood. Work fillers and stains into the grain before set. Wipe excess from surface.

G. Change colors or finishes at corners and joints.
H. Apply materials so that the following results are obtained.

1. Smooth uniform appearance, underlying paint edges feathered, free of brush marks, uneven orange peel, sags, runs or foreign matter.
2. Complete coverage without skips or streaks and without heavy build-up in details.
3. Close match with approved color.
4. Sharp edges at adjoining materials or at color changes.
5. Work stain finishes thoroughly into wood by brushing or rolling.

I. Inspection of Coats: Do not apply additional coats until each completed coat has been inspected by the ARCHITECT/CONTRACTING OFFICER.

1. Only inspected and approved coats of paint shall be considered in determining number of coats applied.
2. Refinish entire surface if coat is not acceptable.

3.7 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

A. Paint shop primed items.
B. Remove unfinished louvers, grilles, covers, steel glazing stops, access panels, and other loose components and paint separately.
C. Clean, prime and paint exposed mechanical and electrical work including: pipes, pipe insulation, conduit, boxes, ducts, hangers, brackets, collars and supports.
D. Protect and retain legibility of data plates and identification markings on mechanical and electrical equipment by masking.

E. Paint interior surfaces of air ducts, and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint, to limit of sight line. Paint dampers exposed behind louvers, grilles and convector and baseboard cabinets to match face panels.
F. Replace electrical plates, hardware, light fixture trim, and fittings removed prior to finishing.

3.8 CLEANING

A. As Work proceeds, promptly remove excess paint products where spilled, splashed or spattered.
B. During progress of Work maintain premises free of unnecessary accumulation of tools, equipment, surplus materials and debris.
C. Remove waste, cloths, and material, which may constitute fire or V.O.C. hazard daily from site.
D. Leave surfaces not required to be finished under this section undamaged and clean and free of paint products from work of this Section.

3.9 COATING SCHEDULE

A. General:

1. For the purposes of this schedule each coat shall be at least dry to the touch before proceeding with the following coat.
2. Coating materials shall be recommended by manufacturer for condition of use and compatible with undercoats.
3. Minimum number of coats is scheduled. Apply additional finish coats as necessary to provide uniform appearing coverage.
4. Refer also to DRAWINGS and Finish Schedule.

5. Sherwin Williams products are referenced. Other manufacturers having similar specifications meeting Quality Assurance specifications may be used.

B. Exterior Coating Schedule:

1. Wood – Painted:

   a. One coat topcoat compatible exterior latex primer sealer; Sherwin Williams “ProBlock”.
   b. Two coats, exterior latex enamel finish, satin sheen Sherwin Williams, “A-100”.

2. Wood – Stained:

   a. Two coats: acrylic solid color stain: Sherwin Williams “Woodscapes”.

3. Factory Painted Metal Siding, Steel previously painted, and steel galvanized:

   a. Spot prime any rust or bare areas with: single component topcoat compatible rust inhibitive primer: Sherwin Williams B66W00310 Pro Industrial “Pro-Cryl” Universal Primer.
   b. First Coat: Single Component waterborne acrylic adhesion bond coating low sheen, recommended for use on factory finished metal, Sherwin Williams B71W211 – “Bond Plex.”

      1) 300 psi minimum adhesion per ASTM 4541.

   c. Second Coat: water base urethane tow component coating. Sherwin Williams “Aurolon 100”.

      1) 1000 psi adhesion per ASTM D4541.
      2) 2000-hour weathering per ASTM D4587.

d. Third Coat:

1) 1000 psi adhesion per ASTM D4541.
2) 2000-hour weathering per ASTM D4587.

4. Steel-Shop Primed: re-prime completely unless shop primer is acceptable for producing finish coat without priming.

a. One coat topcoat compatible rust resisting alkyd resin primer, Sherwin Williams “B50”.
b. Two coats acrylic corrosion resistant enamel, semi-gloss, Sherwin Williams “DTM B66”.

5. Steel-Galvanized:

a. First coat: two component epoxy primer 5 mil to 10 mil thick, Sherwin Williams “Galvite B50”, or approved.
b. Second coat: two-part semi-gloss polyurethane 6 to 7 dry mil thick, Sherwin Williams “Fast Clad”, or approved.

6. Aluminum:

a. One coat direct to metal wash primer.
b. Two coats aliphatic urethane enamel, semi-gloss sheen.

7. Steel Galvanized Unpainted: Repair abrasions and field welds:

a. Two coats zinc rich epoxy primer per SSPC Paint 20: Sherwin Williams “Zinc Clad” or approved.

C. Interior Coating Schedule:

1. Structure ceiling joists, beams and deck:

a. First Coat: waterborne acrylic dry fall 3 to 4.5 dry mils thick, white color egg-shell, Sherwin Williams “B42 W0002”, or approved. Any factory painted decking shall be dulled by wire brushing or brush off blasting and welds and abrasions spot-primed.
b. Finish Second Coat: same as first coat.

2. Wood MDF and MDO- Painted

a. One coat latex primer sealer topcoat compatible: Sherwin Williams, B51, ProBlock”.
b. 2 coats water-based 2 component catalized epoxy satin sheen Sherwin Williams “Pro Industrial K45” Series enamel or approved equal.

3. Wood - Transparent:

a. One coat semi-transparent stain.
b. Filler coat (open grain wood only).
c. One coat sealer.
d. 2 topcoats water borne Polyurethane Varnish: clear satin sheen. Sherwin Williams “Wood Classics A68”.

4. Steel and Aluminum – Bare Unprimed and galvanized - dry use

a. One coat topcoat compatible rust-inhibiting acrylic latex primer: Sherwin Williams “ProCryl B66”.
b. 2 coats acrylic latex enamel, satin sheen: Sherwin Williams “B70”.

5. Steel Doors and Frames – Shop Primed: re-prime completely unless shop primer is acceptable for finish coat without priming. Previously painted steel in sound condition without loose or cracked paint does not require primer.

a. One coat topcoat compatible rust-resisting industrial acrylic latex primer: Sherwin Williams “ProCryl B66”.

b. 2 coats 100% acrylic corrosion resistant coating, semi-gloss Sherwin Williams “DTM B66” series.

6. Steel - Galvanized - wet use areas

   a. Same as exterior.

7. Gypsum Board:

   a. Spot prime any stains with stain blocking primer sealer over stained area; Sherwin Williams “Quick Dry” B51 W08670, sealer primer surfacer, topcoat compatible.
   b. First Coat: Latex high build primer Surfacer: Sherwin Williams “Preprite B28”.
   c. 2 coats washable acrylic latex enamel, eggshell sheen on walls, flat on ceilings. Sherwin Williams “ProMar 200” B31 2600.

      1) Apply finish coat with uniform roller texture as approved in mockup.

8. Insulated Coverings - Cloth

   a. One coat alkyd primer sealer.
   b. 2 coats acrylic latex enamel, satin sheen.

9. Equipment Plywood Wall Backer: Two coats water base flat white color latex fire retardant enamel: Sherwin Williams Flame Control 20-20A or approved.

3.10 COLOR SCHEDULE

A. Unless otherwise specified, refer to the Finish Schedules and Drawings. Match adjacent surface color for the following:

1. Access doors, registers, radiation unit covers, exposed piping, electrical conduit, and mechanical/electrical panels.
2. Exterior wall and roof mounted pipes, ducts, conduits, flues and flashing.

B. Paint surfaces visible behind vents, louvers, grilles and reveals in public areas: flat black.
C. Refer to Reflected Ceiling Plans, Floor Finish Plans, Interior Elevations and Finish Schedule in the DRAWINGS.

END OF SECTION

SECTION 10 14 00
SIGNAGE

PART 1 - GENERAL

1.1 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this Specification. The publications may be referred to in the text by basic designation only. In case of conflict only the most stringent apply:

1. National Electrical Manufacturers Association (NEMA) - Publication for General Purpose Grade Plastic Laminate.
2. Americans with Disabilities Act (ADA) - Accessibility Guidelines for Buildings and Facilities (ADAAG.)

    a. IBC Chapter 11.
    b. ICC - ANSI A117.1 Chapter 7.

1.2 PERFORMANCE REQUIREMENTS

A. DRAWINGS are in part diagrammatic to allow for manufacturer standard details.
B. Size connections, piers, and pipes between sign body and building structure to withstand gravity and seismic loads in accord with International Building Code (IBC) with importance factor of 1.0.

1.3 SUBMITTALS

A. Manufacturer's product literature illustrating letter styles, finish and color selections, dimensions, materials, and attachment.

B. Shop drawings indicating sign lettering, message and location.
C. Sample sign of each type; if approved, samples maybe used in work.

PART 2 - PRODUCTS

2.1 LETTER AND NUMBER PROPORTION

A. Character height: Minimum height letters dependent on viewing distance in accord with ICC/ANSI A117.1 Chapter 7.
B. Spacing: 10 to 35 percent of character height.
C. Separation from edge of sign: 3/8 inch minimum.
D. Character font type: Sans serif block non decorative.

2.2 FINISH AND CONTRAST

A. Characters and background: eggshell, matte, or other non-glare finish.
B. Light-colored characters on a dark background.

2.3 SYMBOLS OF ACCESSIBILITY

A. Pictogram symbols of accessibility shall be in accord with ICC - ANSI A117.1.

2.4 LAYOUTS AND MESSAGES

A. As indicated on Schedule and DRAWINGS. Verify with shop drawing approval before fabricating and installing.

2.5 ACCESSIBLE TOILET AND ROOM SIGNS

A. Letters, numbers and messages 1/32 inch raised tactile upper case, sans serif type accompanied by Grade 2 Braille below the text in accord with ICC – ANSI A117.1.
B. Size:

1. Character: 5/8-inch-high minimum 2 inches high maximum, in accord with ICC - ANSI A117.1.
2. Pictogram: 6 inches minimum high.

2.6 SIGN FABRICATION

A. Straight parallel edges: 1/4-inch in 10 feet. Smooth flush tight joints: 1/32 plus or minus without sharp edges. Countersunk head screws where exposed.
B. Signs

1. 1/8-inch minimum thick sheet metal with enamel paint finish or plastic integral color back plate without sharp edges or warp. Radius corners 1/4 inch minimum.
2. Flat against wall without raised borders for wall mount signs. Screw attach with vandal resistant screws.
3. Construct ADA raised tactile message signs with one of the following methods. The same technique and materials shall be used throughout.

    a. Precisely cut plastic characters and images chemically fused to a plastic backplate.
    b. Photo chemically etched metal.
    c. Reversed engraved plastic to provide raised characters resulting in integral back.
    d. Glued-on raised letters not acceptable.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces and Drawing details to receive work for defects that will adversely affect the work and for deviations beyond allowable tolerances.

B. Start of work shall mean acceptance of interfacing surfaces as capable of producing an acceptable job.

3.2 INSTALLATION

A. General: Installation of signs shall be in accord with ICC – ANSI A117.1, as recommended by the manufacturer, approved submittals and as indicated on DRAWINGS.
B. Install signs flat, without distorting waves or buckles using concealed fasteners were possible. Exposed fasteners shall be countersunk, matching adjacent finishes.
C. Anchor suspended signs to overhead structure or structure columns in accord with approved engineer design.

3.3 WALL SIGN INSTALLATION

A. Install on wall adjacent to latch side of door, where there is no wall space at the latch side of the door, including double leaf doors, place sign to the wall on right side. Mount so that a person may approach within 18 inches of sign without encountering protruding objects or standing within swing of a door.
B. Install between 48 and 60 inches above finish floor to baseline of lowest character.

END OF SECTION

SECTION 10 26 13
WALL CORNER GUARDS

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Section 06 83 16 - Fiber Reinforced Plastic Paneling
B. Section 09 21 16 - Gypsum Board Assemblies

1.2 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification. The publications may be referred to in the text by basic designation. In case of conflict the most stringent shall govern.

1. ASTM A666 - Specification for Annealed or cold-worked Austenitic stainless steel, sheet, strip, plate oval flat bar.
2. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
3. ASTM D256 - Test Method for Determining the Izod Pendulum Impact Resistance of Notched Specimens of Plastics.
4. ASTM D543 – Test Method for Resistance of Plastics to Chemical Reagents.

1.3 SAMPLES

A. Submit sample of proposed corner guard and adhesive tape.
B. Submit 6-inch square sample of proposed wall panel guard and fastener.

PART 2 - PRODUCTS

2.1 CORNER GUARDS

A. One piece 18 gage minimum by 3-1/2 by 3-1/2 by 48 inch type 303 stainless steel, satin finish. Fabricate for tight fit to adjacent wall surface with no sharp edges using double-sided adhesive foam tape.
B. Acceptable Manufacturers:

1. Bobrick B-633: www.bobrick.com
2. C/S CO-8: www.c-sgroup.com
3. Wilkinson Co. www.wilkinsoncompany.com
4. Hager Co. www.hagerco.com
5. IPC In Pro www.inprocorp.com
6. Korogard: https://koroseal.com/products/wall-protection/corner-guards

C. Thirty foot - pound minimum impact strength per ASTM D256.
D. Fire characteristics:

1. Maximum flame spread 10.
2. Maximum smoke 450 per ASTM E84.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Coordinate with other trades to ensure that wall finishes are complete and cured dry.
B. Start of work shall mean acceptance of conditions and capable of producing a satisfactory finished product.

3.2 INSTALLATION

A. Mount corner guards over continuous double side adhesive tape on both adjacent wall surfaces above base molding.

END OF SECTION

SECTION 10 28 13
TOILET ACCESSORIES

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Section 06 83 16 - Fiber Reinforced Plastic Paneling
B. Section 07 92 00 - Joint Sealants
C. Section 09 21 16 - Gypsum Board Assemblies

1.2 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Concealed backing and anchorage backing built into construction.

1.3 APPLICABLE PUBLICATIONS

A. The publications listed form a part of this Specification. The publications are referred to in the text by basic designation only. In case of conflict the most stringent shall apply.

1. ASTM A153 - Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware.
2. ASTM A480 - Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.
3. ASTM A653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
4. ASTM A666 - Specification for Annealed or Cold-Worked Austenitic Stainless Steel, Sheet, Strip, Plate, and Flat Bar.
5. ASTM C1036 - Specification for Flat Glass.
6. ASTM C1048 - Specification for Heat Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass.
7. ANSI Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Materials Used in Buildings.
8. International Building Code (IBC) Chapter 11:1001 American National Standard Institute (ANSI) A117.1.

1.4 SUBMITTALS

A. Manufacturer's Literature: Indicating materials, anchorage, dimensions and design and location in building.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to meeting specified criteria:

1. Bobrick Washroom Equipment, Inc. - www.bobrick.com
2. Bradley Corporation - www.bradleycorp.com
3. A & J Washroom Accessories - www.ajw.com
4. American Specialties, Inc. - www.americanproducts.com
5. Global Industrial - www.globalindustrial.com

2.2 GENERAL

A. Manufacturer's numbers are listed to establish design configurations and quality. Accessories may be selected from any of the acceptable manufacturer's listed which produce equivalents.

1. Sheet metal with rough or sharp edges is not acceptable. Grind smoothly and finish edges and welds.
2. Push buttons shall not require over 5-pound force per ICC/ANSI A117.1. Buttons and knobs shall be operable without pinching or twisting per ANSI A117.1.
3. Refer also to DRAWINGS for locations and quantities.

B. Finish: Stainless steel, ASTM A666 type 302 or 304 satin finish unless otherwise specified. Same finish throughout.

2.3 ACCESSORIES

A. MR - Mirror: Surface mount mitered corner roll formed stainless channel steel frame with galvanized concealed hanging brackets, 1/4-inch tempered glass, Bobrick B-2908 series. Size as indicated on DRAWINGS.
B. MH - Mop Hangar Shelf: Stainless steel surface mount 8 inches deep, 13 inches high by 34 inches long with 3 mop holders and 4 hooks: Bobrick B-239 one at each janitor sink.
C. TTD - Toilet Tissue Dispenser: Surface-mounted, stainless steel twin 9-inch jumbo roll, with hoods, Bobrick B-69997, one at each toilet fixture.
D. PTR - Paper Towel Dispenser: Surface mount 9 inch deep by 12-inch-wide x 15-inch-high stainless steel roll paper: touchless operation, Bobrick B-2860.
E. SD - Soap Dispenser: Surface wall mount stainless steel with clear refill-indicator window 27-ounce liquid soap container and touchless operation: Bobrick B-2013 one at each sink – lavatory.

F. GB - Grab Bars: 1.5 inch outside diameter by 18 gage (1.2 mm) satin finish stainless steel tubing with integral 1/8-inch welded surface mount flanges for 1.5-inch clearance between wall and bar and capable of support of 250 pound force in accordance with IBC, Bobrick B-58616 Series. Locations, per DRAWINGS and ICC/ANSI A117.1. Install with security fasteners. Provide stainless through bolts and washers at toilet partitions.

   1. One, 36-inch long, one 42-inch long, and one 18-inch at each accessible toilet.
   2. One, 30 by 16-inch corner grab bar at each accessible shower.

G. SCD - Toilet Seat Cover Dispenser: Stainless steel 15-3/4 inch wide by 11 inches high by 2 inches deep, surface mounted. 250 seat cover capacity Bobrick B-4221. One at each toilet fixture.
H. SC/RD - Shower Curtain Rod: 1.25-inch diameter by 18 gage (0.50 inch) Stainless steel tubing with surface screw attach flanges each end, Bobrick B207x48. Length to fit shower stall. One each shower.
I. SC - Shower Curtain: Vinyl opaque matte white, .008 inch thick by 42 inch wide by 72 inch high with hemmed edges. Rust proof brass grommets 6 inches on center along top with 7 stainless steel hooks Bobrick 204-2, 204-1. One each shower rod.
J. TH- Towel Hook: Stainless steel 3-inch projection Bobrick B-677.
K. CH- Coat Hook: Mockett: CH12-SSS.
L. BCS - Baby Changing Station: 16 gage Stainless Steel hinged surface wall mount smooth shaped polyethylene plastic bed approximately 22-inch extension by 36 long by 5 inch deep with safety straps, graphic step-by-step instructions, designed for 250 pound static load:

   1. Bobrick B-2230, Koala Corporation - www.babychangingstations.com, Rubbermaid Products - www.rubbermaidcommercial.com, or Brocar - www.ameraproducts.com. One each public toilet room.

2.4HARDWARE AND FASTENERS

A. As necessary for secure attachment to backing capable of developing full strength of accessory.
B. Provide 4 keys for any key service keyed accessories.
C. Exposed fasteners stainless steel countersunk head theft resistant type.

2.5 MOUNTING BACKING

A. In Stud Walls: Minimum 16 gage by 6 inches galvanized sheet steel screwed across three studs behind wallboard. Provide manufacturer approved anchorage to develop adequate strength in stud walls and provide through bolting at toilet partitions for grab bars, shower seat, and baby changing stations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine DRAWING details and field conditions to receive accessories for defects that will adversely affect the completed work, and for deviations beyond allowable tolerances.
B. Coordinate to ensure anchorage backing is adequate in structure and gypsum board is extended continuously in and around recess for recessed accessories.
C. Beginning of installation shall mean acceptance of existing conditions as capable of producing an acceptable job.

3.2 INSTALLATION

A. Mount toilet accessories rigid, level and square in a ready-to-use condition and as indicated on the DRAWINGS or ANSI A117.1 for accessibility and as recommended in writing by the manufacturer.
B. Anchor with expansion bolts to concrete and masonry. Anchor with screws into solid backing in stud walls.
C. Grab bars mounted on toilet partitions to be bolted through with stainless steel washers or plates on opposite side.

END OF SECTION

SECTION 10 44 16
FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 PRODUCTS FURNISHED BUT NOT INSTALLED IN THIS SECTION

A. Mounting embedments, anchorage, block outs, or other items to be incorporated into the adjacent structure.
B. Provide minimum 16 gage by 6-inch sheet steel mounting across 3 studs behind gypsum board.

1.2 RELATED SECTIONS

A. Section 05 41 00 - Load-Bearing Metal Studs
B. Section 09 21 16 - Gypsum Board Assemblies

1.3 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this Specification. Publications may be referenced in the text by basic designation only. In case of conflict only the most stringent shall govern:

1. Underwriters Laboratories Inc. (U.L.) listing and "Building Materials Directory".
2. National Fire Protection Association (NFPA) 10 - Standard Portable Fire Extinguishers.
3. NFPA 14 – Installation of Standpipe, Private Hydrants and Hose Systems.
4. International Fire Code (IFC) 906
5. International Building Code (IBC) 11: ANSI A117.1

1.4 SUBMITTALS

A. Submit dimensions, operational features, materials, finishes, fasteners, anchorage installation instructions, typical details and location in completed work.
B. Submit operations and maintenance data including refilling and recertification.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Protect extinguishers from freezing.

PART 2 - PRODUCTS

2.1 FIRE EXTINGUISHERS

A. U.L. Labeled dry chemical 2A-10BC (11-pound overall weight) rechargeable type.

1. Pressure gage
2. Stainless steel or aluminum nozzle and trigger control.

B. U.L. Labeled wet chemical Class K 1.5 gallon in kitchen with deep fat fryer.
C. Extinguishers shall be fully charged.

2.2 EXTINGUISHER CABINET: PUBLIC AREAS

A. Cabinet not required in staff and custodian areas: Provide wall bracket mount fire extinguishers without cabinet in mechanical, electrical, elevator rooms.
B. Cabinet Box: Formed sheet steel, semi-recessed for 3-1/2 inch deep wall recess within stud walls. Surface mount type on concrete and masonry walls.

1. White enamel finish.

C. Trim: Self-trimming overlapping flanges return-to-wall surface for installation after wall finish is applied. Maximum 4-inch projection from wall finish surface and recessed handles to meet ADA clearance requirements.

1. Brushed aluminum or stainless steel finish.

D. Door: Partial or full view tempered safety glass front with pull-to-break open lock handle, and full-length piano hinge for 180 degree opening.

1. Door frame stainless steel or brushed aluminum.
2. Label: "Fire Extinguisher" or “Fire Hose”: in red color two-inch minimum high letters.

2.3 WALL SIGN

A. Wall mount angle shaped two-faced .060-inch plastic “glo-brite” white and red color with “Fire Extinguisher” message 12-inch-high x 6-inch-wide: www.emedco.com

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine DRAWING details and verify field conditions for defects that will adversely affect the completed work and for deviations beyond allowable tolerances.
B. Verify rough openings for cabinet are correctly sized and located.
C. Beginning installation shall mean acceptance of the interfacing surfaces as capable of producing an acceptable job.

3.2 INSTALLATION

A. General: Installation shall be as recommended by the manufacturer and approved submittal for the conditions of use: complete and ready to use, with all necessary attachments, adaptors, and accessories.

    1. Coordinate with interfacing and related trades as necessary. Gypsum board shall run continuously behind cabinet wall recess for wall fire and sound resistance.
    2. Mount rigidly and permanently into solid backing.
    3. Seal continuously between cabinet and adjacent wall with Sealant per Section 07 92 00 – Joint Sealants.

B. Anchorage: Standard commercial threaded, or expansion anchors recommended for intended use by their manufacturer's literature indicating lateral (shear) and pullout (tension) data for approval.

    1. Minimum anchor diameter: 0.25 inch.
    2. Each anchor shall be capable of developing at least 200-pound lateral load and 200 pound pullout load.

C. Mount operating handle of extinguisher maximum 48 inches above floor as approved by local fire authority and ADAAG.

    1. Surface mount cabinets and extinguishers not in cabinets: 27 inches to bottom from floor

D. Mount extinguishers not in cabinets onto hook into solid backing in wall.

3.3 CLEAN UP

A. Leave extinguisher, cabinet, and adjacent areas clean and free from stains or surplus materials resulting from installation.

3.4 SCHEDULE

A. Typical Installation: Extinguisher in cabinet at locations indicated and a minimum of the following:

   1. Provide one extinguisher for every 1500 square feet, 75 lineal feet of travel distance per IFC 906, and a minimum of one extinguisher at every exit and exterior door on each floor.

B. Extinguisher on wall mount brackets without cabinet: one each in mechanical room and Kitchen.

   1. Locate as directed.

C. Refer to locations on Life Safety Plans in the DRAWINGS.

END OF SECTION

SECTION 10 51 13
METAL LOCKERS

PART 1 - GENERAL

1.1 APPLICABLE PUBLICATIONS

A. The publications listed form a part of this Specification. The publications are referred to in the text by basic designation only. In case of conflict the most stringent shall apply.

1. ASTM A635 – Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by Hot-Dip Process.
2. ASTM A1008/A1005M – Specification for Steel, Sheet, Cold-Rolled, Carbon Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened and Bake Hardenable.
3. International Building Code (IBC) Chapter 11 Accessibility: ANSI A117.1.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's construction data, method of assembly, hinge, latching and locking details, anchorage-attachment, fillers, trim, base, and accessories.
B. Samples:

1. Submit color samples 2 by 2-inch minimum.

2. Provide sample unit of locker assembly illustrating door and corner joints. If approved, sample may be installed into work.

C. Shop Drawings: Submit shop drawings indicating elevations, and size dimensions.
D. Include locker numbering sequence information.
E. Maintenance Data: adjusting, replacement of doors and latching mechanisms.
F. Manufacturer and installer qualifications.

1.3 MANUFACTURER'S QUALIFICATIONS

A. Minimum of 10 project references of similar size where specified product was used, including location, date, with owner names and phone numbers.

1.4 INSTALLER QUALIFICATIONS

A. Minimum of five similar installations and approved by locker manufacturer.

1.5 DELIVERY AND STORAGE

A. Store inside protected from moisture.

1.6 WARRANTIES

A. Welds: Manufacturer's lifetime warranty that welds will not fail causing loose or separated seams.

1. Damage from vandalism or deliberate destruction is excluded.

B. Latches and hinges: manufacturers' two year warranty that latches and hinges remain operable.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS, SUBJECT TO SPECIFIED CRITERIA:

A. Republic Storage Systems Inc.: www.republicstorage.com
B. Penco Products Inc.: www.pencoproducts.com
C. Lyon Workspace Products: www.lyonworkspace.com
D. Debourgh: www.debough.com
E. List Industries Inc.: www.listindustries.com
F. ASI Storage: www.asistorage.com
G. Art Metal Products: www.artmetalproducts.com

2.2MATERIALS

A. Sheet Steel: Mild cold-rolled and stretcher-leveled steel per ASTM A1008, free from buckle, scale, and surface imperfections, and galvannealed per ASTM A635 capable of taking a smooth enamel paint finish.

2.3FABRICATION

A. Construction: Fabricate lockers, square, rigid, and without warp, faces flat and free of dents or distortion. Make all exposed metal flush and smooth free from sharp edges:

1. Weld members together to form rigid, one-piece structure.
2. Factory assemble lockers into welded units suitable for shipping and movement through a 34 inch wide building opening.
3. Bolt factory assembled units together in field. Fasteners shall be stainless steel Torx or similar tamper-resistant through bolts with self-locking nuts. Self-drilling screws, single screwdriver slot bolt head; rivets not accepted.

2.4FINISH

A. Factory chemically pretreat metal with degreasing and phosphatizing process.
B. Apply factory gloss enamel 2 mil thick finish over rust-inhibiting primer to all metal surfaces, exposed and concealed, except non-ferrous metal trim.
C. Color: Provide locker units in colors selected by OWNER from

manufacturer's standards of not less than blue, yellow, red, brown, and grey. Not less than 2 different colors will be selected. Concealed parts may be manufacturer's standard neutral color.

2.5LOCKER COMPONENTS

A. Body:

1. Locker body including tops, bottoms, and sides, shall be constructed of 16 gage minimum steel; back 18 gage minimum steel. Tops and bottoms shall have a flange on four sides. Shelves shall have a single bend on 3 sides with a double bend on the front edge. Locker body components shall be welded together. Provide 16 gage finished end panels without extra holes at locker sides exposed in completed work.

B. Doorframe:

1. Doorframes shall be 16 gage steel channel or integral box formation, securely welded together making a rigid one-piece structure, with a flange forming a continuous door strike.

C. Doors:

1. Typical exposed door faces:

   a. 14 gage steel minimum with edge and back stiffeners.
   b. Ventilating louvers near top and bottom: open area: 7 percent minimum of door area.

2. Open vent face door faces where indicated: 14 gage vent perforated with edge and back stiffners.

D. Welds:

1. Weld locker assembly in a pattern for rigid, tightly joined seams between members. Welds shall penetrate parent material on both sides of seam and be free of defects including but not limited to burn through, slag spatter, sharp protrusions, porosity, undercutting, and cracks.

    a. Fillet Weld ¾-inch minimum long x 9 inch max spacing.
    b. Spot welds ¼-inch minimum diameter with visible dimple on both pieces joined x 6 inch max spacing.

E. Door Hinges:

1. 14 gage by 3-1/2 inch minimum long 7 knuckle or full height continuous style: Minimum 3/16-inch diameter pin. Hinge welded to doorframe and securely fastened to the door with steel rivets in a manner, which facilitates door replacement. Hinges shall operate smoothly and quietly.
2. 3 hinges minimum or continuous for doors over 42-inches in height
3. 2 hinges or continuous at doors less than 42-inches in height.

F. Latching Mechanism:

1. Provide latching devices, with recessed handles and lock area. Provide 3 rubber bumpers along doorjamb contact points. Provide slide latches in channel, allowing door to close while the lock is in a locked position. The latch assembly shall be quieted by the use of plastic spacer devices to isolate the latch assembly from locker door.

G. Accessibility:

1. Provide at least one locker in each locker area or room and five

percent in accord with IBC 1109 accessible in accord with ANSI 308 including 48-inch maximum height above floor to shelves or hanger-hooks and door control hardware not requiring tight grasping or twisting in accord with ANSI 404.

H. Locks:

1. Provide hasps in recessed area for padlock use (padlocks by others). No protruding handles.

I. Number Plates:

1. Each locker door: polished aluminum number plate with contrasting etched or embossed 3/8 inch high letter numbers attached with 2 rivets. Plates shall be capable of letter-number message similar to 1000, 1001, etc.

J. Shelves and Hooks (Typical Lockers):

1. Lockers shall have one 16 gage shelf, no lower than 18-inches below top of locker. Lockers shall be furnished with cadmium or zinc plated forged steel hooks with ball tip, consisting of 1 double prong ceiling hook and 3 single prong wall hooks attached with rivets or Torx security screws.

K. Metal Base:

1. Minimum 14 gage sheet, continuous 'Z' steel closed base at front and exposed sides with 1-1/2 inch flanges. 4-inch height.

L. Trim Filler Panels

1. As necessary to provide continuous front of lockers in recessed wall

areas: 20 gage, same finish as adjacent locker.

2.6 ANCHORAGE TO BUILDING

A. Provide anchors at top and bottom of each unit.
B. Provide drilled in expansion anchor bolts, 1/4-inch by 2-inch embed minimum for concrete and masonry walls and floors and with 3/4-inch diameter washers.
C. Provide self-drilling continuous thread anchor screws 1/4 by 1-1/2 inch embed minimum into solid blocking or studs at stud framed walls. At CONTRACTOR'S option a continuous metal attach plate may be attached exposed across stud framed walls: Minimum 12 gage by 6-inches high by locker width screwed with two 1/4 -inch screws into each stud.
D. Anchor bolts and washers: Stainless Steel or hot dip galvanized.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine DRAWINGS and verify field conditions to receive lockers for defects that will adversely effect the work.
B. Beginning of installation shall mean acceptance of existing conditions as capable of producing an acceptable job.

3.2INSTALLATION

A. Install lockers of sizes and at locations shown. Anchor into building in accordance with manufacturer's instructions for plumb, level, flosh and rigid installation.
B. Space anchor fastenings 16-inches on center maximum top and bottom walls and apply through flat washers or back-up reinforcing plates where necessary to avoid metal distortion; conceal fasteners, when locker doors are closed.
C. Screw into building wall studs or solid backing with screws noted in anchorage section.
D. Set base in continuous sealant and attach with screws 16-inches on center maximum.a

3.3CLEANING

A. Remove excess materials and debris caused by installation as work progresses. Clean lockers of dirt, metal filings, packing labels and leave surfaces in clean polished condition.
B. Replace units with defective finish: scratches, chips, paint runs.

    1. Field paint touch up limited to minor areas which can be repaired with small artists brush rendering repair imperceptible from 5 feet and not over one square inch in any three adjacent locker faces. Use paint touch up materials recommended by locker manufacturer.

C. Adjust doors and latches to operate easily without binding.

3.4SCHEDULE

A. Typical Locker:

1. 18-inch wide by 18-inch deep by 72-inch high single tier with shelves and hooks.
2. Provide lockers as indicated on DRAWINGS.

END OF SECTION

SECTION 11 30 13
RESIDENTIAL APPLIANCES

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Section 06 20 00 - Finish Carpentry and Architectural Woodwork
B. Section 06 41 16 - Laminate Faced Cabinets
C. Division 22 - Mechanical Systems
D. Division 26 - Electrical Systems

1.2 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this Specification. The publications may be referred to in the text by basic designation only. In case of conflict only the most stringent shall apply.

1. Underwriters Laboratories Inc. (UL) listing and “Building Materials Directory”.
2. National Fire Protection Association (NFPA) No. 70 “National Electric Code” (NEC).
3. American Gas Association (AGA).

1.3 SUBMITTALS

A. Manufacturer’s Literature: Indicating finish, anchorage, dimensions and operation of appliances.
B. Warranties, parts lists, maintenance instructions.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS SUBJECT TO SPECIFIED CRITERIA:

A. LG
B. Samsung

C. Frigidaire
D. General Electric
E. Westinghouse
F. Whirlpool
G. Maytag
H. Manufacturer's numbers have been listed to establish design configuration. Equipment may be selected from any of the acceptable manufacturers listed which produce equivalent configurations, sizes and functions. Refer also to DRAWINGS for locations, clearances, and quantities.

2.2 FINISH

A. Appliances shall be white or stainless steel.

2.3 CLOTHES WASHER

A. Electric 120 volt.
B. Free standing 24-inch maximum width, approximately 34 inches high and 25 inches deep, front loading residential design to match clothes dryer.
C. Variable water level control, 4 cycles: "regular", "permanent press", "knits", and "soak".
D. 3 wash/rinse temperature combination with energy save cold water rinse.
E. Stackable with stacking kit as required.

2.4 CLOTHES DRYER

A. Electric 240-volt, 3 wire.
B. Free standing 24-inch maximum width, approximately 34 inches high and 25 inches deep, front loading residential design to match clothes washer.
C. 4 Cycles: "regular", "damp dry", permanent press/knits", and "de-wrinkle".
D. 3 Drying Selections: "normal", "low" and "no-heat fluff".
E. Stackable with stacking kit as required.

2.5ACCESSORIES

A. Anchors, adapters, backguards, trim kits, duct transition adaptors, electrical and plumbing connections to building electrical system outlets, including special receptacle plugs and similar accessories, fitting to and mounting on equipment necessary for complete functional operation in accord with codes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine spaces and the DRAWING details which receive the appliances for defects that will adversely affect the completed work and for deviations beyond allowable tolerances.
B. Verify outlets, service connections and rough openings are acceptable.
C. Start of installation or delivery of appliances to project shall mean acceptance of the interfacing surfaces as capable of producing an acceptable job.

4.2INSTALLATION

A. Connect and install equipment into functioning position in accordance with these SPECIFICATIONS, DRAWINGS, and manufacturer's written instructions, including leveling.
B. Ice Maker:

1. Provide 2 ½" clearance on hinged side for 90-degree door opening, and door handle.
2. No additional clearance around sides, top or rear of unit is needed for ventilation
3. Do not obstruct front grille air flow.

4.3CLEANING

A. Equipment shall be left clean, free from shipping labels, and shipping protection. Packing cartons, crates and damage shall be removed from the project. Paint or other finishes damaged from appliance installation shall be repaired by replacing damaged components.

4.4LOCATION SCHEDULE

A. Storage 101

1. Clothes Washer.
2. Clothes Dryer.

END OF SECTION

SECTION 11 41 20
WALK-IN FREEZER

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Section 07 92 00 - Joint Sealants
B. Division 22 – Mechanical
C. Division 26 - Electrical

1.2 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this Specification. The publications are referred to in the text by basic designation only. In case of conflict the most stringent shall apply.

1. ASTM A653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot Dip Process.
2. ASTM B117 – Practice for Operating Salt Spray (Fog) Apparatus.
3. ASTM C1029 – Standard Specification for Spray-Applied Rigid Cellular Polyurethane Thermal Insulation.
4. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
5. International Building Code (IBC) 2021.

1.3 PERFORMANCE REQUIREMENTS

A. Fire Characteristics: IBC 2603.4.1.2 foam plastic compliant.

1. Flame spread 25 or less, smoke developed 450 maximum for 4-inch thickness in accord with ASTM E 84.
2. Covering 0.032 inch aluminum or 0.0160 inch (26 gage) galvanized steel and white painted finish.

B. Size components to fit existing panel height and interface as indicated on Drawings.
C. Horizontal panels shall span supports indicated with 40 psf load with deflection limited to L/240 or one inch maximum.
D. Thermal Properties: foamed-in-place urethane per ASTM C1029, 2.2

to 2.6 pounds/cubic foot, nominal 6 R value per inch.

E. Completed assembly shall comply with National Sanitation Foundation standards.

1.4 SUBMITTALS

A. Shop Drawings, and Product Data to Illustrate:

1. Conformance with Performance Requirements:
    a. Provision for panel attachment, connection and seal.
2. Installation instructions, Layout and Details:
    a. Layout of Panels: Indicate size of panels, joints and edges at adjacent different materials.
    b. Details of joints.
    c. Note all dimensions required for installation.
3. Joints:
    a. Inter-relationship of components vapor seal and trim.
    b. Sealant and sealant tape specifications.
4. Panel fire certification and test data to verify IBC conformance.

1.5 QUALITY ASSURANCE

A. Fabricator/Installer: Where indicated units of equipment require custom fabrication, provide units fabricated by shops which are skilled and with a minimum of 5 years of experience in similar work.

B. UL Labels: Where available, provide UL Labels on prime electrical components of food service equipment. Provide UL “recognized marking” on other items with electrical components, signifying listing by UL, where available.

C. National Electrical Code: Comply with the National Electrical Code standards and criteria, which are applicable to this work.

D. Health Codes: Comply with applicable codes and standards of local health authorities.

1.6 WARRANTIES

A. Panels: Manufacturer’s 2-year warranty that panels will not delaminate, rupture, or fail structurally.

PART 2 - PRODUCTS

2.1 WALK-IN FREEZER UNITS

A. General: Walk-in coolers or freezers provided under this portion of specifications shall be prefabricated of modular design and construction. They shall be designed to allow convenient and accurate field assembly and future enlargement by the addition of panels.

B. PANEL FABRICATION

1. Standard wall, ceiling, and floor panels shall be full size 2' and 4' in width and shall be interchangeable with like panels. Height of walk-ins shall be as indicated. Corner panels shall be 90 degree angles with actual 6" or 12" exterior horizontal measurements. Full size 1' and 3' panels shall be used if required to meet jobsite conditions.
2. Panels shall consist of foamed-in-place urethane insulation, sandwiched between interior and exterior metal "skin" which has been die-formed and gauged for uniformity in size.
3. Edges of panels shall be foamed-in-place tongue and groove with locking facilities foamed-in-place at time of fabrication.

C. INSULATION

1. Insulation shall be a full four (4) inches thick, UL Class 1 rigid foamed-in-place polyurethane with a minimum 2.0 cubic foot density. The "K" factor shall be no more than 0.135 BTU per hour per square foot, per inch thickness, per degree Fahrenheit of temperature difference. Heat transfer "U" factor shall not exceed 0.033. The "R" value shall be a minimum of 30.00. Insulation shall be 95% closed cell structure. Flame spread rating according to ASTME-84/UL 723 shall be 25 or less. Polyurethane foam shall be expanded with HCFC-22. Insulation containing ozone depleting CFC's will not be acceptable.

D. PANEL LOCKING ASSEMBLIES

1. Assembly of walk-in shall be accomplished by Posi-Locs. Posi-Locs shall be foamed-in-place and activated by a hex wrench provided by the manufacturer. Access ports to locking devices shall be covered by snap caps. Access ports shall be interior to allow assembly of walk-in from the outside.

E. SECTION GASKETS

1. N.S.F. listed gaskets shall be foamed-in-place to the male side of all panels, on both interior and exterior. Gaskets shall be impervious to stains, greases, oils, mildew, etc.

F. ENTRANCE DOOR AND DOOR PANEL

1. Each walk-in shall be fitted with one standard 36" x 84" swing-type door. The door shall be flush type, stainless steel. Doors and door section shall be listed by Underwriters Laboratories and equipped with the following:
    a. Door shall be equipped with magnetic gasket, Posi-Seal door closure and latch to open the door by breaking the magnetic force of the gasket. Hardware has provisions for locking and a safety release which prevents entrapment of personnel within the box.
    b. Door shall be self-closing with three strap-type, camlift hinges.
    c. Doorjamb shall be made of extruded aluminum with a thermal break. An isolated, low wattage heater strip covered by magnetically attracting stainless steel shall be fitted onto this jamb. This strip shall provide perfect sealing of magnetic gasket and prevent frost and condensation build-up.
    d. Each entrance door section shall be provided with a junction box in lieu of incandescent light, pilot light switch, and rigid conduit between switch box and outlet box. Concealed wiring shall be standard on each entrance door section.
    e. A heavy gauge threshold with non-skid stripping shall be provided with each door section. Heater wire shall continue beneath the threshold.
    f. Provide door with 1/8” diamond tread kick plate inside and outside.

G. PARTITIONS

1. Fabrication and finish of partition walls shall be the same as the walk-in walls and shall lock into wall, ceiling, and/or floor panels with Posi-Loc assemblies. Tongue and groove foam fabrication shall provide the thermal break between cooler and freezer compartments. Wall "T" panels shall be 23" x 12" symmetrical tee. Heater wires not required.

H. N.S.F. APPROVAL

1. All walk-ins shall be fabricated to comply with National Sanitation Foundation No. 7. The N.S.F. label shall be affixed to the interior door pan. All interior corners, including floor and ceiling, shall be coved.

I. AIR VENT

1. A Tri-Action air vent shall be provided to equalize pressure between the interior and exterior, caused by sudden temperature changes due to door openings and evaporator defrosting. The vent shall be heated to prevent moisture and/or frost accumulation.

J. INSTALLATION INSTRUCTIONS

1. A complete set of installation instructions shall be included with the walk-in. These instructions shall cover the erection and assembly of the walk-in. A floor plan print shall be included.

K. REFRIGERATION EQUIPMENT

1. Refrigeration equipment shall be selected, and systems designed to produce the required freezer internal temperatures indicated on the mechanical drawings.
2. Supplier shall provide a complete refrigeration system design, including selecting appropriate equipment, safeties and controls, sizing piping and selecting materials that are industry standard and that comply with local codes.
3. Condensing units shall be fully hermetic or accessible hermetic type. Refrigerant shall be R-404a unless otherwise specified. Condenser shall be air-cooled. Condensing units shall be factory assembled and U.L. listed. Evaporators shall be low profile forced air type unless otherwise specified. Air discharge shall be parallel to the walk-in ceiling. Fan motors, guards, multi-fin and tube-type coil, shall be housed in heavy gauge aluminum housing. Unit shall have drain pan with suitable drain pipe connection: Freezer evaporators shall have an automatic electric defrost system including heaters, time clock, fan delay control, heated drain pan and adjustable defrost limit. Defrost shall be time initiated and temperature terminated with built-in fail-safe control. All evaporators shall be U.L. listed. Systems including condensing unit rack and refrigerant lines shall be installed by a qualified refrigeration contractor with minimum 5 years of demonstrated experience installing similar equipment.
4. These basic components shall be supplied by refrigeration manufacturer:
    a. Remote with necessary major parts for field installation. Remote parts include condensing unit, evaporator, control, expansion valve drier, sight glass, vibration eliminator, and evaporator mounting kit.
    b. All refrigeration components and/or systems shall be factory assembled and tested in accordance with best commercial procedures. Good commercial start-up and check-out procedures shall be used by a qualified refrigeration contractor. All components shall have a one (1) year factory warranty. Capacities, CFM, and voltage requirements shall be shown in a separate schedule.

L. DRAIN LINES

1. Installing contractor shall provide suitable drain lines from all evaporators. Drain shall be trapped outside the walk-in. Freezer drains shall be heated and insulated to prevent freeze-up. All plumbing to be in accordance with local codes.

M. ELECTRICAL REQUIREMENTS

1. Provide a 208V, single phase, single point of connection for the freezer to power all internal loads:
    a. Evaporator
    b. Condenser
    c. Heat Trace (drain line from evaporator)
    d. Interior freezer lighting controlled via an interior light switch

2.2 CLOSURES, AND TRIM

A. Provide preformed edges or trim at the edges of the panel system at interface with adjacent different materials, corners, and at penetrations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrate, Drawing details, and conditions under which panels will be installed.
B. Verify field measurements. Modify work as required for fit.
C. Beginning installation shall mean acceptance of existing conditions as capable of producing an acceptable job.

3.2 INSTALLATION OF WALK-INS

A. Install in accordance with approved submittals and manufacturer's written instructions.
B. Erect panels with horizontal lines straight and level and vertical lines plumb.
C. Complete field assembly joints in the work (joints that cannot be completed in shop) by welding, bolting-and-gasketing, or similar methods as indicated. Grind welds smooth and restore finish. Set or trim gaskets flush, except for "T" gaskets as indicated.
D. Install closure plates and strips where required, with joints coordinated with units of equipment.
E. Install sealants all around each unit to make joints air-tight, waterproof, vermin-proof and sanitary for cleaning purposes. In general, make sealed joints not less than 1/8" wide, and stuff with backer rod to shape sealant bead properly, at ¼" depth. Shape exposed surfaces of sealants lightly concave, with edges flush with faces of materials at joint. At

internal corner joints, apply sealant or gaskets to form a sanitary cover, of not less than 3/8" radius. Provide sealant-filled or gasketed joints up to ¾" joint width; metal closure strips for wider joints, with sealant application each side of strips. Anchor gaskets mechanically or with adhesives to prevent displacement. All sealants to be silicone type with fungicide.

3.3 DISSIMILAR MATERIALS

A. Aluminum contacting steel, concrete, masonry, treated wood and the like shall have contact surfaces separated by a heavy coat of bituminous paint, 40 mil self-adhering rubber sheet or by non-absorptive tape.
B. Separation materials shall not be visible in exposed completed work.

3.4 TOLERANCES

A. Alignment: 1/4 inch in 20 feet, maximum variation from vertical and level.
B. 1/8-inch maximum variation from adjacent panel surface.
C. Panel flatness: maximum 0.8 percent of panel length out of flat plane. No obvious "oil canning" when viewed from 10 feet.

3.5 TESTING, START-UP AND INSTRUCTIONS

A. GENERAL: Delay start-up of food service equipment until service lines have been tested, balance, and adjusted for pressure, voltage and similar considerations; and until water and steam lines have been cleaned and treated for sanitation.
B. Test each item of operational equipment to demonstrate that it is operating properly and that controls and safety devices are functioning. Repair or replace equipment that is found defective in its operation, including units that are below capacity or operating with excessive noise or vibration.
C. Instruct Owner's operating personnel in proper operation and maintenance procedures for each item of operational food service equipment.
D. Lubricate equipment in accordance with manufacturer's recommendations.
E. Final Cleaning: After testing and start-up, and before the time of substantial completion, clean and sanitize food service equipment, and leave in condition ready for use in food service. Immediately after date of

substantial completion (after inspections and tests have been completed, cover food service equipment with 4-mill polyethylene film as protective cover, taped and tied down to prevent discoloration).

END OF SECTION

SECTION 11 82 19

PACKAGED INCINERATORS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Factory built, packaged, manual batch feed, pathological, and solid waste incinerator with burners, stack, controls, and accessories.

1.2 QUALITY ASSURANCE

A. Coordinate the entire assembly of incinerator, stack, controls, fuel supply.

B. Provide written certification that the entire assembly has been coordinated to achieve the required performance and to provide the required features.

C. Equipment, installation, and operation shall conform to NFPA 82 or incinerator certification agencies from country of manufacturing origin. Where conflicts exist between NFPA 82 and this specification, this specification shall govern.

D. Provide written certification that the incinerator complies with permit to construct issued by Alaska Department of Environmental Conservation (ADEC).

1.3 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Contractor shall submit and obtain approval of all Alaska Department of Environmental Conservation Permits which are associated with the incinerator.

C. Incinerator:

1. Arrangement, description of construction, and outline drawings of incinerator and accessories showing clearances and dimensions.
2. Predicted performance including burn time based on waste composition specified.
3. Calculation of secondary chamber retention time.
4. Piping and stack connection locations and sizes.
5. Technical data including temperature rating and arrangement of refractory and insulation.
6. Weights of unit and loading diagram of foundation.
7. Recommended anchorage to foundation.
8. Predicted external surface temperatures.
9. Certified test report on performance of similar unit burning waste types 4 which has composition similar to Article, PROJECT CONDITIONS, this specification:
    a. Overall burn time and weight reduction.
    b. Waste quantity and composition per batch.
    c. Auxiliary fuel use.

10. Catalog data on burners, sound attenuators, fuel trains, motors.
11. Electrical service requirements for all motors and controls.
12. Predicted sound level of all systems.
13. Schematic diagrams of control systems. Catalog cuts on components of control and instrument systems. Description of operation of control system.
14. Arrangement and location of control panels.

D. Stack System:

1. Drawings showing system arrangement and dimensions.
2. Weights of subassemblies.
3. Design, construction, pressure and temperature limitations of entire system including expansion joints and dampers.
4. Support point locations and loads for entire system.

1.4 PROJECT CONDITIONS

A. Waste Material to be Incinerated Each Day:

1. Typical Day:
   a. General Waste: Not the primary function for this incinerator but capable to provide the functionality.
   b. Pathological Waste: 1800 pounds.
   c. Daily Feeding Schedule: One batch in each of two eight hour shifts each day.

2. Waste Composition by Weight:
   a. Pathological Waste: 95 percent Type 4, 5 percent plastic.

B. Auxiliary Fuel:

1. Fuel oil: Furnished under Government contract. Number 2 burner fuel.

1.5 DEFINITIONS:

A. Type 0 Waste: Trash, rated 19.8 MJ/kg (8500 BTU per pound). A mixture of highly combustible waste such as paper, cardboard and wood. Contains up to 10 percent by weight of petrochemical waste, 10 percent moisture, and 5 percent non-combustible solids.

B. Type 1 Waste: Rubbish, rated 15.1 MJ/kg (6800 BTU per pound). Combustible waste paper, cartons, rags, wood scraps, floor sweepings. Contains up to 25 percent moisture and up to 10 percent non-combustible solids.

C. Type 4 Waste: Animal remains, rated 2.3 MJ/kg (1000 BTU per pound). Consists of carcasses, organs, and solid organic wastes from reindeer harvesting. Contains up to 85 percent moisture and 5 percent non-combustible solids.

1.6 APPLICABLE PUBLICATIONS:

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation only.

B. ASTM International (ASTM):

C401-12 (2018).....Standard Classification of Alumina and Alumina-Silicate Castable Refractories

C612-17.....Mineral Fiber Block and Board Thermal Insulation

C. National Fire Protection Association (NFPA):

70-11.....National Electrical Code

82-09.....Incinerators and Waste and Linen Handling Systems and Equipment

D. Underwriters Laboratories (UL):

50-07.....Enclosures for Electrical Equipment

PART 2 - PRODUCTS

2.1 INCINERATOR

A. Type: Controlled air, multi-stage combustion, manual batch feed, factory assembled, packaged unit. Auxiliary burners designed for firing Number 2 fuel oil. Basis-of-Design Product: Subject to compliance with requirements, Atlas Incinerator SLP 1500 in 20' container or approved equal. Color to be determined by Owner based on manufacturer's standard color chart.

B. Service: Designed for batch feeding with feeding schedules and waste materials as specified. Incineration process shall convert the waste and auxiliary fuel to carbon dioxide, water vapor and ash. No waste materials will be fed to the incinerator during the burning process. All components weatherproof for outdoor location.

C. Performance:

1. Emissions in Flue Gas:
   a. To be in compliance with approved ADEC permit

D. Operation:

1. Primary Chamber:
   a. Provide manual door for waste feed, access door for manual ash removal, burner, underfire combustion air.
   b. Burners shall commence firing to ignite the load after loading of waste is complete and required temperature is reached in secondary chamber and shall automatically operate to maintain adjustable minimum temperature sufficient for proper combustion. In the pathological mode, one or more burners shall fire continuously until the end of a timed cycle.
   c. Provide automatic modulating combustion air supply controlled by effluent temperature leaving the primary chamber. Adjustable setpoint range 800-2400 degrees F. Burner shall fire only when combustion air supply has automatically increased to the highest flow rate and effluent temperature is below the set point.

2. Secondary Chamber:
   a. Includes elements of the incinerator where volatiles and entrained particulates are burned. Retention time is based on the volume of these elements. Measure volume

from downstream of location of last introduction of combustion air.

b. Automatic modulating combustion air supply controlling effluent gas temperatures. Adjustable set point range 1500-2400 degrees F.

c. Secondary burner shall automatically operate to control effluent gas temperatures when temperatures go significantly below the temperature setting of the combustion air control. Burner shall operate at start-up and achieve the required secondary chamber temperature with the primary chamber burner not operating.

E. Design:

1. Primary Chamber:
   a. Enclosure: Carbon steel of sufficient thickness and reinforcing to preclude deflection. All surfaces lined with refractory backed with insulation board or insulating refractory. Hearth shall be castable refractory with raised rim to prevent waste fluid leakage.
   b. Refractory: Minimum rating 2700 degrees F castable, ASTM C401, Class D or higher; or, equivalent firebrick.
   c. Refractory Anchors: Stainless steel AISI 304, 310, or 316 high temperature type, 8 mm (0.31-inch) minimum thickness. Anchors within 610 mm (two feet) of burner AISI 316 stainless steel. Maximum spacing three times refractory thickness. Length
   d. 2/3 - 3/4 refractory thickness, staggered arrangement.
   e. Insulating Board: Mineral fiber, ASTM C612, Class 5.
   f. Charging Door: Refractory lining and insulation same as incinerator enclosure. Minimum clear opening 48 inches. Temperature of door handles shall be sufficiently low to allow operation with bare hands. Counter balance top-opening doors.
   g. Combustion Air Ducts and Ports: Designed to avoid plugging or to permit cleaning from outside the incinerator.
   h. Ash Removal Door: Refractory lined and insulated same as shell. Hinged, operable by one person. Locate at lowest part of chamber so that ashes can be raked from the incinerator into a container.

2. Secondary Chamber:
   a. Enclosure: Carbon steel of sufficient thickness and reinforcing to preclude deflection. All surfaces lined with refractory backed with insulation board or insulating refractory.
   b. Refractory: Minimum rating 2700 degrees F. Castable refractory ASTM C401, Class D or higher; or equivalent firebrick.
   c. Refractory Anchors: Stainless steel AISI 304, 310, or 316 high temperature type, 0.31-inch minimum thickness. Anchors within two feet of burner AISI 316 stainless steel. Maximum spacing three times refractory thickness. Length 2/3 - 3/4 refractory thickness. Staggered arrangement.
   d. Insulating Board: Mineral fiber, ASTM C612, Class 5.
   e. Access: Provide access openings to allow cleaning and repair of all areas.

3. Viewports: Provide sufficient quantity to allow inspection of at least 75 percent of hearth area.

F. Exterior Finish: Provide heat resistant surface treatment, prime and finish coats of standard color of incinerator manufacturer.

2.2 BURNERS

A. Type: Fuel oil, forced draft, automatic firing, with fuel valve trains and safety interlock devices.

Designed to burn fuel listed in PART I.

B. Igniter: Direct electric ignition or gas igniter (pilot).

C. Code Compliance: Fuel valves, safety and interlock devices shall be UL listed for burner service. Provide dual automatic safety shut off valves on fuel train.

D. Flame Safeguard: Automatic programmer, microprocessor-based solid state electronic with self-diagnostics, UL-listed. Lockout on flame failure and on actuation of interlocks. Flame failure response time four seconds maximum. Provide ten second trial for ignition.

E. Burner Operation Control: Actuated by temperature controllers and operating cycle controllers.

F. Fuel Pressure Control: Provide pressure regulator.

G. Automatic Burner Shut-Down Interlocks Required:

1. Low combustion air flow.
2. High and low fuel pressure.
3. Fuel valves not closed prior to ignition.

H. Automatic Burner Cooling: Provide control to automatically provide cooling air if burner overheats when not firing. Cooling air flow shall not cause emissions to exceed limits.

2.3 FORCED DRAFT FAN

A. Type: Electric motor driven, inlet or outlet damper controlled. Design for required combustion air at site altitude.

B. Dampers: Heavy duty, self-lubricating bearings, adjustable linkage.

C. Sound Attenuators: Provide attenuators on fan intakes to reduce sound levels to meet requirements.

2.4 MOTORS

A. Direct-connected, high-efficiency, non-overloading under all operating conditions, design for 104 degrees F ambient. Provide totally enclosed motors on outdoor installations, open-drip-proof on indoor installations.

2.5 CONTROLS AND INSTRUMENTS

A. General: Complete microprocessor-based system providing automatic operation and monitoring of incinerator with manual starting of normal cycle and manual initiation of a pathological burning cycle.

B. Control Functions and Arrangement:

1. Start-Up:
   a. Provide lockable start switch. Actuation of manual switch shall start forced draft fan and then shall initiate automatic prepurge of entire incinerator with eight air changes

and then shall start secondary chamber burner.

b. Primary chamber burner shall be locked out until secondary chamber reaches set temperature 1500 - 2000 degrees F.
c. After charging waste, actuation of manual switch shall start primary chamber burner.
d. Manual initiation of pathological mode shall actuate automatic cycle that keeps the primary chamber burners in continuous operation for an adjustable time-period.

2. Operation of Incinerator:
   a. Automatic modulation of combustion air to primary and secondary chambers to maintain adjustable set temperatures in each chamber.
   b. Automatic operation of secondary chamber burner to maintain adjustable minimum temperature in secondary chamber.
   c. Automatic operation of primary chamber burner to maintain adjustable minimum temperature in primary chamber.
   d. Interlock to prevent opening of primary chamber access doors until combustion and burn-down cycles are complete.

3. Burn-Down Cycle:
   a. Automatic timed operation of primary and secondary chamber forced draft fan and burners.
   b. Automatic shut-down of entire system at conclusion of burn-down.

C. Operation Indicators:

1. Type: LED or industrial pilot lights, oil tight, transformer type, different color for each function.
2. Functions:
   a. Power on.
   b. Forced draft fan on.
   c. Burners on.
   d. Pathological mode.

D. Alarm Indicators: Low temperatures.

E. Temperature Indicators:

1. General: Provide indicators of primary chamber temperature, secondary chamber exit temperature.
2. Indicators:
   a. Dial type or digital, direct reading, 0 - 2400 degrees F range, thermocouple sensors, minimum accuracy plus or minus 0.10 percent of full scale. Thermocouples shall have metal-ceramic protection tubes.

F. Control Panel:

1. Locate manual switches, and indicating and recording (if furnished) devices in panel mounted approximately three feet from the incinerator and convenient to the feeding area.
2. Panel Construction: Cabinet-type enclosure, hinged access door full size of panel, key lock, equipment mounted on sub-bases. Locate indicating lights, alarms, manual switches, recorder (if furnished) on outside face of panel. NEMA 3 panel for outdoor installations; NEMA 12 for indoor installations (UL-50).
3. Interior and Exterior Finish: Corrosion-resistant prime coat after metal has been cleaned. Two coats of surfacer sanded smooth, two coats of lacquer or enamel. Incinerator manufacturers' standard colors.

4. Identification: All elements on face of and inside panel shall be labeled with laminated plastic nameplates secured to the panel. Nomenclature shall be keyed to wiring diagram. Standard labeling system of manufacturer is acceptable if it has equal clarity and durability.
5. Panel Mounting: Surface mount to structural element of the building.
6. Wiring and Piping:
    a. General: All devices mounted on and in the panel shall be factory-wired.
    b. Wiring: Conform to National Electrical Code NFPA 70, all wiring in troughs, termination in terminal blocks, wiring coded by numbers or color. Provide 20 percent extra terminals in terminal blocks. Number all terminals on terminal blocks.
    c. Power Wiring (over 120 volts): No exposed bare wires or terminals within the panel.

2.6 STACK

A. Factory-built system coordinated with requirements of incinerator.

B. Service: Design for continuous temperature of 2700 degrees F, wind loading in compliance with local conditions in Savoonga, Alaska, internal pressure plus or minus five inches WC.

C. Size (Diameter): Sufficient to allow negative pressure in incinerator primary chamber under all operating conditions.

D. Type: Steel jacketed, refractory lined, circular cross section, // UL listed for ___inches clearance to combustible materials and ____inches clearance to non-combustible materials//.

E. Construction:

1. Complete factory-engineered system consisting of factory-built standard sections connected in the field with joining system designed by system manufacturer.
2. Clean-out door where shown.
3. Gas-tight connections between sections.
4. Bracing system to withstand wind loading in compliance with local conditions in Savoonga, Alaska, and designed to accommodate thermal expansion.
5. Emmision monitoring ports shallbe in compliance with approved Alaska DEC Permit
6. Provide expansion joints as necessary and as shown to accommodate thermal expansion.
7. Roof penetrations: Refer to Section 07 62 10, FLASHING AND TRIM.
8. Coating: Galvanized outer wall. On portion outside the building, provide prime and finish coats of heat and corrosion-resisting paint.

F. Accessories:

1. Spark Arrestor: Stainless steel cylindrical screen on flue gas outlet, reinforced.
2. Draft Control: Provide if required for proper operation of the incinerator. Automatic, adjustable barometric damper sized and located in accordance with damper and incinerator manufacturers' recommendations.

2.7 SPARE PARTS

A. Provide manufacturer’s expected wearing parts for two years.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Equipment Access Openings: Arrange all equipment and piping to allow access to openings without disassembly of equipment or piping. Provide space which permits full opening of all doors, panels, and other access openings.

B. Fuel Oil System: Coordinate set pressure of house fuel oil system with requirements of burner-mounted pumps. Do not exceed inlet pressure limitations (typically 14 kPa or 2 psi or less), or suction lift capabilities of burner-mounted pumps.

C. Pipe all drains to floor drain.

D. Anchor all equipment to structure as shown or as recommended by manufacturer with allowance for thermal expansion as necessary and seismic requirements for Savoonga, Alaska.

E. Control and Instrument Panel: Locate panel so that all control switches and indicators are within 5.5 feet of the floor and are located alongside the area where personnel will be loading the unit.

F. Clean interior and exterior of all equipment before placing in service.

G. Initially operate incinerator at firing rates and time periods recommended by the manufacturer of the refractory to provide proper curing of the refractory. Provide printed curing instructions from refractory manufacturer at the site prior to first start-up.

3.2 INSPECTIONS AND TESTS

A. Prior to requesting commencement of the performance and acceptance test, conduct final checking of system installation in accordance with the manufacturer's recommendations and the requirements of the other sections of the project specifications. Include in final checking: preliminary operation testing and adjustments of facilities as necessary to ensure completeness of installation and satisfactory operation of all systems. Schedule all tests in advance, conduct at times approved, and perform in the presence of the Contracting Officer.

B. Incinerator Tests:

1. Reduction of Waste:
   a. Test shall be conducted by factory-authorized representative of incinerator manufacturer.
   b. Demonstrate required weight reduction of specified waste. Waste shall be fed in a single batch to the unit. After termination of manufacturer's predicted burning period, inspect and weigh the residue.

2. Emissions: Testing shall be in accordance with Alaska DEC test procedures to ensure incinerator meets all necessary Alaska DEC permit requirements.
3. Sound Levels: Demonstrate conformance to sound level limitation.
4. Report: Furnish complete written report (three copies), which includes test data, calculations, results compared with requirements, list of personnel, and other pertinent information. Furnish report within three weeks of test date.

END OF SECTION

SECTION 12 24 13
WINDOW ROLLER SHADES

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Section 06 10 00 - Rough Carpentry - wood backing and blocking.
B. Section 09 21 16 - Gypsum Board Assemblies
C. Section 09 51 00 – Acoustical Ceiling Systems

1.2APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification. The publications may be referred in the text by basic designation only. In case of conflict, only the most stringent shall apply.

   1. Underwriters Laboratories Inc. (UL) listing and labeling.

1.3WORK FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

A. Backing and suspension to be built into the surrounding construction for secure anchorage.

1.4SYSTEM DESCRIPTION

A. Horizontal roller shade cloth sun screens installed at windows as indicated.

1.5SUBMITTALS

A. Product Data: Material descriptions, construction details, dimensions of components and profiles, features, and finishes.

   1. Shade fabrics: openness, fire resistance and material specifications.

B. Shop Drawings: Show location and extent of roller shades. Include elevations, sections, details, mountings, and dimensions not shown in Product Data. Show installation details, mountings, and attachments to adjacent work, operational clearances, and relationship to adjoining work.

C. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:

1. Ceiling suspension system members and attachment to building structure.
2. Ceiling-mounted or penetrating items including trim moldings at walls, and interface with acoustical ceilings.
3. Shade mounting assembly and attachment.

D. Samples of shade cloth for Initial Selection.

1. Not less than 12-inch square section of fabric, illustrating range of color-texture available. Show complete pattern repeat. Mark top and face of material.

E. Fire retardant: shade product Test Reports.
F. Maintenance Data: Include the following:

1. Methods for maintaining roller shades and finishes.
2. Precautions about cleaning materials and methods that could be detrimental to fabrics, finishes, and performance.

G. Fabricator experience qualifications.

1.6 QUALITY ASSURANCE

A. Fabricator: Successful experience manufacturing commercial roller sunshades with 25 similar installations.
B. Fire Test Response: passes NFPA 701.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in factory packages, marked with manufacturer and product name, fire retardant characteristics**,** and location of installation indicated on Drawings.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Do not install roller shades until construction and wet and dirty finish work in spaces, including painting, is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturers:

1. MechoShade Systems, Inc.: www.mechoshade.com
2. Draper Inc: www.draperinc.com
3. Hunter Douglas Window Fashions: www.hunterdouglas.com

2.2 ROLLER SHADE ASSEMBLY

A. Complete working assembly recommended for commercial and school classroom light control use assembly from one of the acceptable manufacturers.
B. Shade Cloth Fabric:

1. BLIND 1: Semi-Transparent Shadecloth: MechoShade Systems, Inc., EuroTwill series: 0.010 diameter (0.254 mm) non-raveling vinyl/polyester yarn, fabric thickness0.025 90.635 mm), 3% openness.
2. Minimum Tensile Strength: 250 pounds.
3. Fire Characteristics: per test method indicated or by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

   a. Flame-Resistance Ratings: Passes NFPA 701.

C. Rollers: Electrogalvanized, factory painted steel or extruded-aluminum tube of diameter and wall thickness required to support and fit internal components of operating system without visible sagging; easily removable from support brackets; with manufacturer's standard method for attaching shade material.
D. Direction of Roll: Regular shade falls at window side of roller.
E. Mounting Brackets: Suspend or wall surface attach to structure only; use finish ceiling only for closure trim.
F. Head box with Ceiling Slot Opening: Six-sided box units for recessed surface installation; formed-steel sheet, or extruded aluminum with a bottom slot opening to allow lowering and raising of shade. Removable continuous meal bottom access panel.
G. Side channel shade guides: as necessary for shade fabric provided.
H. Bottom Bar: Steel or extruded aluminum with plastic or metal capped ends.
I. Manual Operation: with bead chain and spring assisted clutch locking

operation: recommended for heavy duty institutional use.

J. Permanently lubricated moving parts.
K. Unit Sizes: fabricated in sizes to cover window openings.
L. Installation Accessories: Fasteners, Adaptors and Hangars: as necessary for securing and finishing to supporting substrate.
M. Color-Coated Finish: for components exposed to view; manufacturers' standard low gloss white.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and openings are ready to receive the work.
B. Do not commence fabrication until field measurements are confirmed.
C. Ensure structural backing and supports are correctly placed.
D. Beginning of installation means installer accepts existing surfaces as capable of producing an acceptable job.

3.2 ROLLER SHADE INSTALLATION

A. Install roller shades level, plumb, square, according to manufacturers written instructions.

1. Provide two-inch minimum space between shade and glass surface.

3.3 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, and free from binding throughout entire operational range.

3.4 CLEANING AND PROTECTION

A. Clean roller shade surfaces after installation, according to manufacturers written instructions.

3.5DEMONSTRATION

A. Provide 3-hours training of Owner's maintenance personnel to adjust, operate, and maintain systems.

3.6SCHEDULE

A. Manual Operated (BLIND 1): At each window.

END OF SECTION

SECTION 22 11 16
DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper tube and fittings - domestic water.
2. PEX tube and fittings - domestic water.
3. PEX-AL-PEX tube and fittings - domestic water.
4. PEX-AL-HDPE tube and fittings - domestic water.
5. Piping joining materials - domestic water.
6. Encasement for piping.
7. Transition fittings - domestic water.
8. Dielectric fittings - domestic water.

B. Related Requirements:

1. Section 331415 "Site Water Distribution Piping" for water-service piping outside the building from source to the point where water-service piping enters the building.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. System purging and disinfecting activities report.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Installers of pressure-sealed joints are to be certified by pressure-seal joint manufacturer as having been trained and qualified to join piping with pressure-seal pipe couplings and fittings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Domestic water piping, tubing, fittings, joints, and appurtenances intended to convey or dispense water for human consumption are to comply with the U.S. Safe Drinking Water Act, with requirements of authorities having jurisdiction, and with NSF 61 and NSF 372, or be certified in compliance with NSF 61 and NSF 372 by an ANSI-accredited third-party certification body, in that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

2.2 PIPING MATERIALS

A. Potable-water piping and components are to comply with NSF 14, NSF 61, and NSF 372. Include marking "NSF-pw" on piping.

2.3 COPPER TUBE AND FITTINGS - DOMESTIC WATER

A. Drawn-Temper Copper Tube: ASTM B88, Type L.
B. Annealed-Temper Copper Tube: ASTM B88, Type L.
C. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.
D. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, pressure fittings.
E. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
F. Cast Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.
G. Wrought Copper Unions: ASME B16.22.
H. Copper-Tube, Mechanically Formed Tee Fitting - Domestic Water: For forming T-branch on copper water tube.

    1. Not allowable. Use manufactured fittings.

I. Grooved, Mechanical-Joint, Copper Tube Appurtenances - Domestic Water:

    1. Not allowable.

J. Pressure-Seal-Joint Fittings, Copper or Bronze - Domestic Water:

1. Source Limitations: Obtain pressure-seal-joint fittings, copper or bronze, from single manufacturer.
2. Housing: Copper.
3. O-Rings and Pipe Stops: EPDM.
4. Tools: Manufacturer's special tools.

K. Copper-Tube, Push-on-Joint Fittings - Domestic Water:

   a. Not allowable.

2.4 PEX TUBE AND FITTINGS - DOMESTIC WATER

A. PEX Tube - Domestic Water:

1. Source Limitations: Obtain PEX tube from single manufacturer.
2. Tube Material: PEX plastic in accordance with ASTM F876 and ASTM F877.

B. PEX Tube Fittings - Domestic Water:

1. Source Limitations: Obtain PEX tube fittings from single manufacturer.
2. Fittings: ASTM F1807, metal insert and copper crimp rings, ASTM F1960, cold expansion fittings and reinforcing rings.
3. Push-Fit Fittings: ASSE 1061, push-fit fittings.

C. Manifold: Multiple-outlet, plastic or corrosion-resistant-metal assembly complying with ASTM F876; with plastic or corrosion-resistant-metal valve for each outlet.

2.5 PIPING JOINING MATERIALS - DOMESTIC WATER

A. Pipe-Flange Gasket Materials:

1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
2. Full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
C. Solder Filler Metals: ASTM B32, lead-free alloys.
D. Flux: ASTM B813, water flushable.
E. Brazing Filler Metals: AWS A5.8M/A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

F. Plastic, Pipe-Flange Gaskets, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

2.6 DIELECTRIC FITTINGS - DOMESTIC WATER

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 - Domestic Water:

1. Source Limitations: Obtain dielectric unions from single manufacturer.
2. Standard: ASSE 1079.
3. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges - Domestic Water:

1. Source Limitations: Obtain dielectric flanges from single manufacturer.
2. Standard: ASSE 1079.
3. Factory-fabricated, bolted, companion-flange assembly.
4. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits - Domestic Water:

1. Source Limitations: Obtain dielectric-flange insulating kits from single manufacturer.
2. Nonconducting materials for field assembly of companion flanges.
3. Pressure Rating: 150 psig.
4. Gasket: Phenolic, Temperature Rating: 225 deg F.
5. Bolt Sleeves: Phenolic or polyethylene.
6. Washers: Phenolic with steel backing washers.

E. Dielectric Nipples - Domestic Water:

1. Source Limitations: Obtain dielectric nipples from single manufacturer.
2. Standard: IAPMO PS 66.
3. Electroplated steel nipple complying with ASTM F1545.
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

3.1 PIPING APPLICATIONS

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 (DN 50) and smaller is to be the following:

    1. Drawn-temper copper tube, ASTM B88, Type L; cast- or wrought- copper, solder-joint fittings; and soldered joints.
    2. Drawn-temper copper tube, ASTM B88, Type L; copper pressure-seal-joint fittings; and pressure-sealed joints.
    3. PEX tube, NPS 1 and smaller.

        a. Fittings for PEX tube:

            1) ASTM F1807, metal insert and copper crimp rings.
            2) ASTM F1960, cold expansion fittings and reinforcing rings.
            3) ASSE 1061, push-fit fittings.

3.2 INSTALLATION OF PIPING

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 domestic water piping level [with 0.25 percent slope downward toward drain] [without pitch] and plumb.
C. Rough-in domestic water piping for water-meter installation in accordance with utility company's requirements.
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 to permit valve servicing.

F. 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.
G. Install piping free of sags and bends.
H. Install fittings for changes in direction and branch connections.
I. Install PEX tube with loop at each change of direction of more than 90 degrees.
J. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.
K. Install pressure gauges on suction and discharge piping for each plumbing pump and packaged booster pump.
L. Install thermometers on inlet and outlet piping from each water heater.
M. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230500 "Common Work Results for HVAC."

3.3 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. Threaded Joints: Thread pipe with tapered pipe threads in accordance with ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

    1. Apply appropriate tape or thread compound to external pipe threads.
    2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.
E. Soldered Joints for Copper Tubing: Apply ASTM B813, water-flushable flux to end of tube. Join copper tube and fittings in accordance with ASTM B828 or CDA's "Copper Tube Handbook."

F. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools and procedure recommended by pressure-seal-fitting manufacturer. Leave insertion marks on pipe after assembly.
G. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts in accordance with ASME B31.9.
H. Joints for PEX Tubing, ASTM: Join in accordance with ASTM F1807 for metal insert and copper crimp ring fittings and ASTM F1960 for cold expansion fittings and reinforcing rings.
I. Joints for PEX Tubing, ASSE: Join in accordance with ASSE 1061 for push-fit fittings.
J. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.4 INSTALLATION OF DIELECTRIC FITTINGS

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
B. Dielectric Fittings for NPS 2 (DN 50) and Smaller: Use dielectric unions.

3.5 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for hangers, supports, and anchor devices in Section 230529 "Hangers and Supports for Mechanical Piping and Equipment."
B. Support horizontal piping within 12 inches of each fitting.
C. Support vertical runs of PEX tube to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.6 PIPING 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. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
2. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
3. 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.

3.7 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 in accordance with 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.

3.8 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. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
5. Remove and clean strainer screens. Close drain valves and replace drain plugs.
6. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
7. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.9 FIELD QUALITY CONTROL

A. 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 installation 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.

END OF SECTION

SECTION 22 13 16
SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Hub-and-spigot, cast-iron soil pipe and fittings.
2. Hubless, cast-iron soil pipe and fittings.
3. ABS pipe and fittings.
4. Specialty pipe fittings.

B. Related Requirements:

1. Section 221313 "Facility Sanitary Sewers" for sanitary sewerage piping and structures outside the building.
2. Section 221329 "Sanitary Sewerage Pumps" for effluent and sewage pumps.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For hubless, single-stack drainage system. Include plans, elevations, sections, and details.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans and elevations or Building Information Model (BIM) drawn to scale, showing items described in this Section and coordinated with all building trades.

B. Seismic Qualification Certificates: For waste and vent piping, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Detailed description of piping anchorage devices on which the certification is based and their installation requirements.

C. Field quality-control reports.

1.4 WARRANTY

A. Listed manufacturers to provide labeling and warranty of their respective products.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Components and installation are capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10 ft. head of water
2. Waste, Force-Main Piping: per local utility specs for vacuum waste system.

B. Seismic Performance: Soil, waste, and vent piping and support and installation to withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2.2 PIPING MATERIALS

A. Piping materials to bear label, stamp, or other markings of specified testing agency.

B. 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.

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

A. Pipe and fittings in this article are available in NPS 2 to NPS 15 (DN 50 to DN 375).

B. Pipe and Fittings:

1. Marked with CISPI collective trademark.
2. ASTM A74, service and extra-heavy cast iron.

C. Gaskets: ASTM C564, rubber.

D. Caulking Materials: ASTM B29, pure lead and oakum or hemp fiber.

2.4 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe in "Pipe and Fittings" Paragraph below is available in NPS 1-1/2 to NPS 15 (DN 40 to DN 375).

B. Pipe and Fittings:

1. Marked with CISPI collective trademark.
2. ASTM A888 or CISPI 301.

C. Single-Stack Aerator Fittings: ASME B16.45, hubless, cast-iron aerator and deaerator drainage fittings.

D. CISPI, Hubless-Piping Couplings:

1. Standards: ASTM C1277 and CISPI 310.
2. Description: Stainless steel corrugated shield with stainless steel bands and tightening devices; and ASTM C564, rubber sleeve with integral, center pipe stop.

E. Heavy-Duty, Hubless-Piping Couplings:

1. Standards: ASTM C1277 and ASTM C1540.
2. Description: Stainless steel shield with stainless steel bands and tightening devices; and ASTM C564, rubber sleeve with integral, center pipe stop.

2.5 ABS PIPE AND FITTINGS

A. NSF Marking: Comply with NSF 14 for plastic piping components. Include "NSF-dwv" marking for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

B. Solid-Wall ABS Pipe: ASTM D2661, Schedule 40.

C. Cellular-Core ABS Pipe: ASTM F628, Schedule 40.

D. ABS Socket Fittings: ASTM D2661, made in accordance with ASTM D3311, drain, waste, and vent patterns.

E. Solvent Cement: ASTM D2235.

2.6 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in ODs or of different materials. Include end connections of 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. Standard: ASTM C1173.
    b. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
    c. End Connections: Same size as and compatible with pipes to be joined.
    d. Sleeve Materials:
        1) For Cast-Iron Soil Pipes: ASTM C564, rubber.
        2) For Plastic Pipes: ASTM F477, elastomeric seal or ASTM D5926 PVC.
        3) For Dissimilar Pipes: ASTM D5926 PVC or other material compatible with pipe materials being joined.
4. Shielded, Nonpressure Transition Couplings:
    a. Standard: ASTM C1460.
    b. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
    c. End Connections: Same size as and compatible with pipes to be joined.

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPING

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.

1. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
2. 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 and in accordance with applicable code and utility requirements.

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.

1. 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.
2. 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.
    a. Straight tees, elbows, and crosses may be used on vent lines.
3. Do not change direction of flow more than 90 degrees.
4. Use proper size of standard increasers and reducers if pipes of different sizes are connected.
    a. Reducing size of waste piping in direction of flow is prohibited.

K. Install soil and waste and vent piping at the following minimum slopes unless otherwise indicated:

1. Building Sanitary Waste: Two percent downward in direction of flow for piping NPS 3 and smaller;
2. Horizontal Sanitary Waste Piping: Two percent downward in direction of flow.
3. Vent Piping: One percent down toward vertical fixture vent or toward vent stack.

L. Install cast-iron soil piping in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

M. Install aboveground ABS piping in accordance with ASTM D2661.

N. Plumbing Specialties:

1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary waste gravity-flow piping.
    a. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping.
    b. Comply with requirements for cleanouts specified in Section 221319 "Sanitary Waste Piping Specialties."
2. Install drains in sanitary waste gravity-flow piping.

O. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

P. Install sleeves for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for sleeves specified in Section 230500 "Common Work Results for Mechanical Systems.

Q. Install sleeve seals for piping penetrations of concrete walls and slabs.

1. Comply with requirements for sleeve seals specified in Section 230500 "Common Work Results for Mechanical Systems.

R. Install escutcheons for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for escutcheons specified in Section 230500 "Common Work Results for Mechanical Systems.

3.2 JOINT CONSTRUCTION

A. Hub-and-Spigot, Cast-Iron Soil Piping Gasketed Joints: Join in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Hub-and-Spigot, Cast-Iron Soil Piping Caulked Joints: Join in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead-and-oakum caulked joints.

C. Hubless, Cast-Iron Soil Piping Coupled Joints:

1. Join hubless, cast-iron soil piping in accordance with CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

D. Threaded Joints: Thread pipe with tapered pipe threads in accordance with ASME B1.20.1.

1. Cut threads full and clean using sharp dies.
2. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

a. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
b. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
c. Do not use pipe sections that have cracked or open welds.

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 in accordance with the following:

1. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.
2. ABS Piping: Join in accordance with ASTM D2235 and ASTM D2661 appendixes.

3.3 INSTALLATION OF SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. Install transition couplings at joints of piping with small differences in ODs.
2. In Waste Drainage Piping: Shielded, nonpressure transition couplings.
3. In Aboveground Force Main Piping: Fitting-type transition couplings.

3.4 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for pipe hanger and support devices and installation specified in Section 230529 "Hangers and Supports for Mechanical Piping and Equipment".

1. Install stainless steel pipe hangers for horizontal piping in corrosive environments.
2. Install stainless steel pipe support clamps for vertical piping in corrosive environments.
3. Vertical Piping: MSS Type 8 or Type 42 clamps.
4. Install individual, straight, horizontal piping runs:

a. 100 Ft. (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
b. Longer Than 100 Ft. (30 m): MSS Type 43, adjustable roller hangers.

c. Longer Than 100 Ft. (30 m) if Indicated: MSS Type 49, spring cushion rolls.

5. Multiple, Straight, Horizontal Piping Runs 100 Ft. (30 m) or Longer: MSS Type 44 pipe rolls. Support pipe rolls on trapeze.
6. Base of Vertical Piping: MSS Type 52 spring hangers.

B. Install hangers for cast-iron soil piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

C. Install hangers for ABS piping, with maximum horizontal spacing and minimum rod diameters, to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

D. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.

E. Support vertical runs of soil piping to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

F. Support vertical runs of **ABS** piping to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.5 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 waste and vent piping to the following:

1. Plumbing Fixtures: Connect waste 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 waste 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 waste piping as indicated.

a. Provide shutoff valve if indicated and union for each connection.
b. Use flanges instead of unions for connections NPS 2-1/2 and larger.

D. Connect force-main piping to the following:

1. Sanitary Sewer: To exterior force main.
2. Sewage Pump: To sewage pump discharge.

E. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

F. Make connections in accordance with 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.

3.6 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 waste and vent piping in accordance with 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.

a. 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 waste and vent piping until it has been tested and approved.

a. Expose work that was covered or concealed before it was tested.

3. Roughing-in Plumbing Test Procedure: Test waste and vent piping except outside leaders on completion of roughing-in.
   a. Close openings in piping system and fill with water to point of overflow, but not less than 10 ft. head of water.
   b. From 15 minutes before inspection starts to completion of inspection, water level must not drop.
   c. 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.
   a. 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.
   b. Use U-tube or manometer inserted in trap of water closet to measure this pressure.
   c. Air pressure must remain constant without introducing additional air throughout period of inspection.
   d. 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.

E. Test vacuum-main piping in accordance with procedures of authorities having jurisdiction. Provide documented and approved test results to the Owner.:

3.7 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect sanitary waste and vent piping 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 Plastic Piping: Protect ABS plumbing vents exposed to sunlight with two coats of water-based latex paint.

E. Repair damage to adjacent materials caused by waste and vent piping installation.

3.8 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Aboveground, waste and vent piping NPS 4 (DN 100) and smaller are to be the following:

1. Service cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings and hubless, single-stack aerator fittings; hubless-piping couplings; and coupled joints.
3. Solid-wall ABS pipe, ABS socket fittings, and solvent-cemented joints.

END OF SECTION

SECTION 22 34 00
FUEL-FIRED, DOMESTIC-WATER HEATERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Commercial, oil-fired, storage, domestic-water heaters.
2. Domestic-water heater accessories.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.[Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings:

1. Include diagrams for power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Equipment room drawing or BIM model, drawn to scale, on which the items described in this Section are shown and coordinated with all building trades.

B. Seismic Qualification Data: Certificates, for fuel-fired, domestic-water heaters, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Product Certificates: For each type of [commercial, oil-fired,] domestic-water heater.

D. Domestic-Water Heater Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction.

E. Source quality-control reports.

F. Field quality-control reports.

G. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fuel-fired, domestic-water heaters to include in emergency, operation, and maintenance manuals.

1.5 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of fuel-fired, domestic-water heaters that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
    a. Structural failures including storage tank and supports.
    b. Faulty operation of controls.
    c. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Periods: From date of Substantial Completion.
    a. Commercial, Oil-Fired, Domestic-Water Heaters:
        1) Storage Tank: Three years.
        2) Burner: One year.
        3) Controls and Other Components: One year.
    b. Expansion Tanks: Five years.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and use.

B. Seismic Performance: Commercial domestic-water heaters shall withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
2. Component Importance Factor: 1.0.

C. ASHRAE/IES Compliance: Fabricate and label fuel-fired, domestic-water heaters to comply with ASHRAE/IES 90.1.

D. ASME Compliance:

1. Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
2. Where ASME-code construction is indicated, fabricate and label commercial, finned-tube, domestic-water heaters to comply with ASME Boiler and Pressure Vessel Code: Section IV.

E. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 and NSF 372.

2.2 OIL-FIRED, DOMESTIC-WATER HEATERS

A. Commercial, Oil-Fired, Storage, Domestic-Water Heaters:

1. Source Limitations: Obtain domestic-water heaters from single source from single manufacturer.
2. Standard: UL 732 for storage, domestic-water heaters.
3. Storage-Tank Construction: ASME-code steel with 150-psig minimum working-pressure rating.
    a. Tappings: Factory fabricated of materials compatible with tank. Attach tappings to tank before testing.
        1) NPS 2 (DN 50) and Smaller: Threaded ends in accordance with ASME B1.20.1.
        2) NPS 2-1/2 (DN 65) and Larger: Flanged ends in accordance with ASME B16.5 for steel and stainless steel flanges and in accordance with ASME B16.24 for copper and copper-alloy flanges.
    b. Interior Finish: Comply with NSF 61 and NSF 372 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.

c. Lining: Glass complying with NSF 61 and NSF 372 barrier materials for potable-water tank linings, including extending lining into and through tank fittings and outlets.

4. Factory-Installed, Storage-Tank Appurtenances:

a. Anode Rod: Replaceable magnesium.
b. Dip Tube: Required unless cold-water inlet is near bottom of tank.
c. Drain Valve: Corrosion-resistant metal with hose-end connection.
d. Insulation: Comply with ASHRAE/IES 90.1.
e. Jacket: Steel with enameled finish.
f. Temperature Control: Adjustable thermostat.
g. Relief Valves: ASME rated and stamped for combination temperature-and-pressure relief valves. Include one or more relief valves with total relieving capacity at least as great as heat input and include pressure setting less than working-pressure rating of domestic-water heater. Select one relief valve with sensing element that extends into storage tank.

5. Oil Burners:

a. Standard: UL 296 for use with No. 2 fuel oil.
b. Safety Control: Automatic, high-temperature-limit cutoff device or system.
c. Draft Regulator: Barometric type or adjustable-damper device.

2.3 DOMESTIC-WATER HEATER ACCESSORIES

A. Domestic-Water Expansion Tanks:

1. Source Limitations: Obtain domestic-water heaters from single source from single manufacturer.
2. Description: Steel, pressure-rated tank constructed with welded joints and factory-installed, butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.
3. Construction:

a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.
b. Interior Finish: Comply with NSF 61 and NSF 372 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
c. Air-Charging Valve: Factory installed.

4. Capacity and Characteristics:

a. Working-Pressure Rating: 150 psig
b. Capacity Acceptable: 3 gal**.** minimum.
c. Air Precharge Pressure: 55 psig

B. Drain Pans: Corrosion-resistant metal with raised edge. Include dimensions not less than base of domestic-water heater, and include drain outlet not less than NPS 3/4 with ASME B1.20.1 pipe threads.

C. Piping-Type Heat Traps: Field-fabricated piping arrangement in accordance with ASHRAE/IES 90.1.

D. Heat-Trap Fittings: ASHRAE 90.2.

E. Manifold Kits: Domestic-water heater manufacturer's factory-fabricated inlet and outlet piping for field installation, for multiple domestic-water heater installation. Include ball-, butterfly-, or gate-type shutoff valves to isolate each domestic-water heater and balancing valves to provide balanced flow through each domestic-water heater.

F. Comply with requirements for ball-, butterfly-, or gate-type shutoff valves specified in Section 220523 "General-Duty Valves for Plumbing Piping."

   1. Comply with requirements for balancing valves specified in Section 221119 "Domestic Water Piping Specialties."

G. Combination Temperature-and-Pressure Relief Valves: Include relieving capacity at least as great as heat input, and include pressure setting less than working-pressure rating of domestic-water heater. Select relief valves with sensing element that extends into storage tank.

   1. Oil-Fired, Domestic-Water Heaters: ASME rated and stamped.

H. Pressure Relief Valves: Include pressure setting less than working-pressure rating of domestic-water heater.

   1. Oil-Fired, Domestic-Water Heaters: ASME rated and stamped.

I. Vacuum Relief Valves: ANSI Z21.22/CSA 4.4.

J. Domestic-Water Heater Stands: Manufacturer's factory-fabricated steel stand for floor mounting, capable of supporting domestic-water heater and water. Provide dimension that will support bottom of domestic-water heater minimum of 18 inches above the floor.

K. Domestic-Water Heater Mounting Brackets: Manufacturer's factory-fabricated steel bracket for wall mounting, capable of supporting domestic-water heater and water.

2.4 SOURCE QUALITY CONTROL

A. Factory Tests: Test and inspect assembled domestic-water heaters specified to be ASME-code construction, in accordance with ASME Boiler and Pressure Vessel Code.

PART 3 - EXECUTION

3.1 INSTALLATION OF DOMESTIC-WATER HEATER

A. Commercial, Domestic-Water Heater Mounting: Install commercial domestic-water heaters stable base with anchoring as required for seismic compliance.

1. Maintain manufacturer's recommended clearances.
2. Arrange units so controls and devices that require servicing are accessible.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to supported equipment.
5. Anchor domestic-water heaters to substrate.

B. Install domestic-water heaters level and plumb, in accordance with layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping. Comply with requirements for shutoff valves specified in Section 220523 "General-Duty Valves for Plumbing Piping."

C. Install oil-fired, domestic-water heaters in accordance with NFPA 31.

1. Install shutoff valves on fuel-oil supply piping to oil-fired water-heater burners without shutoff valves. Comply with requirements for shutoff valves specified in Section 231113 "Facility Fuel-Oil Piping."

D. Install water heaters with seismic-restraint devices.

E. Install combination temperature-and-pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend domestic-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

F. Install piping-type heat traps on inlet and outlet piping of domestic-water heater storage tanks without integral or fitting-type heat traps.

G. Fill domestic-water heaters with water.

H. Charge domestic-water expansion tanks with air to required system pressure.

I. Install dielectric fittings in all locations where piping of dissimilar metals is to be joined. The wetted surface of the dielectric fitting contacted by potable water shall contain less than 0.25 percent of lead by weight.

3.2 PIPING CONNECTIONS

A. Comply with requirements for domestic-water piping specified in Section 221116 "Domestic Water Piping."

B. Comply with requirements for fuel-oil piping specified in Section 231113 "Facility Fuel-Oil Piping."

C. Drawings indicate general arrangement of piping, fittings, and specialties.

D. Where installing piping adjacent to fuel-fired, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

3.3 IDENTIFICATION

A. Perform tests and inspections with the assistance of a factory-authorized service representative as needed to maintain warranty.

B. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Domestic-water heaters will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION

SECTION 22 42 00
COMMERCIAL PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Commercial lavatories.
2. Commercial showers.
3. Commercial sinks.
4. Commercial water closets.
5. Toilet seats.

1.2 DEFINITIONS

A. FRP: Fiberglass-reinforced plastic.

B. PMMA: Polymethyl methacrylate; also known as "acrylic."

C. Standard-Efficiency Flush Volume: 1.6 gal. per flush.

D. High-Efficiency Flush Volume: 1.28 gal. or less per flush.

E. WaterSense Fixture: Water closet and/or flushometer valve/tank certified by the EPA to meet the WaterSense performance criteria.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for plumbing fixtures.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings:

1. Plans, elevations, sections, and mounting details.
2. Details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Diagrams for power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:

1. For lavatories and faucets.
2. For shower valves to include in maintenance manuals
3. For sinks and faucets to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Lavatory faucets, sink faucets, shower valves, and wash fountain spray heads and faucets intended to convey or dispense water for human consumption are to comply with the U.S. Safe Drinking Water Act (SDWA), with requirements of the Authority Having Jurisdiction (AHJ), and with NSF 61 and NSF 372, or be certified in compliance with NSF 61 and NSF 372 by an ANSI-accredited third-party certification body, in that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

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.

2.2 COMMERCIAL LAVATORIES

A. Lavatories, Counter Mounted:

1. Lavatories, Undercounter Mounted - Vitreous China, Oval:

a. Fixture:

1) Standard: ASME A112.19.2/CSA B45.1.
2) Type: For undercounter mounting.
3) Nominal Size: Oval, 19 by 16 inches.
4) Faucet-Hole Punching: No holes.
5) Faucet-Hole Location: On countertop.
6) Color: per Owner.
7) Mounting Material: Sealant and undercounter mounting kit.

B. Lavatory Faucets, Manually Operated :

1. Standard: ASME A112.18.1/CSA B125.1.
2. Operation Type: Single control, mixing.

3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and fixture receptor.
4. Body Material: Commercial, solid-brass, or die-cast housing with brazed copper and brass waterway.
5. Finish: Polished chrome plate
6. Maximum Flow Rate: 0.5 gpm
7. Mounting Type: Deck, exposed
8. Valve Handle(s): Single lever.
9. Spout: Rigid.
10. Spout Outlet: Aerator

2.3 COMMERCIAL SHOWERS

A. Showers, Individual:

1. Showers, Individual - FRP, One Piece without Top:

a. Source Limitations: Obtain FRP showers without top from single source from single manufacturer.
b. Description: FRP shower enclosure with valve and receptor and appurtenances.
c. Standard: CSA B45.5/IAPMO Z124.
d. Style: Standard, Accessible in accordance with ICC A117.
e. Shower Nominal Size and Shape: per drawings
f. Color: Per Owner.

B. Shower Valve Assemblies:

1. Shower Valve Assemblies - Single-Handle, Pressure-Balanced Mixing Valve with Head

a. Description: Single-handle, pressure-balance mixing valve with hot- and cold-water indicators; check stops
b. Shower Valve:

1) Standards:

a) ASME A112.18.1/CSA B125.1.
b) ASSE 1016/ASME A112.1016/CSA B125.16.

2) Body Material: Solid brass.
3) Finish: Polished chrome plate
4) Mounting: Concealed.
5) Operation: Single-handle, twist or rotate control.
6) Antiscald Device: Integral with mixing valve
7) Check Stops: Check-valve type, integral with or attached to body; on hot- and cold-water supply connections.

c. Shower Head:

1) Standard: ASME A112.18.1/CSA B125.1.
2) Type: [Ball joint with arm and flange].
3) EPA WaterSense: Required.
4) Shower Head Maximum Flow Rate: 1.5 gpm.
5) Shower Head Material: Metallic with chrome-plated finish.
6) Spray Pattern: Adjustable
7) Integral Volume Control: Not required.

2.4 COMMERCIAL SINKS

A. Kitchen/Utility Sinks:

1. Kitchen/Utility Sinks, Counter Mounted - Stainless Steel >:

a. Source Limitations: Obtain sinks from single source from single manufacturer.
b. Fixture:

1) Standard: ASME A112.19.3/CSA B45.4.
2) Type: Stainless steel, self-rimming, sound-deadened unit.
3) Number of Compartments: per drawings.
4) Overall Dimensions: per drawings.
5) Material: 18 gauge, Type 304 stainless steel.

a) Depth: Standard.

B. Faucet(s): per drawings Sink Faucets, Manually Operated:

1. Sink Faucets, Manually Operated <Insert designation: Single control, mixing.

a. Source Limitations: Obtain sink faucets from single source from single manufacturer.
b. Standards:

1) ASME A112.18.1/CSA B125.1.
2) NSF 61.
3) NSF 372.

c. Description: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and sink receptor.
d. Body Material: Commercial, solid-brass, or die-cast housing with brazed copper and brass waterway.
e. Maximum Flow Rate: 1.0 to 1.28 gpm.

2.5 COMMERCIAL WATER CLOSETS

1. Water Closets, Floor Mounted - Bottom Outlet, Close-Coupled Flushometer Tank

    a. Source Limitations: Obtain water closets from single source from single manufacturer.
    b. Standard: ASME A112.19.2/CSA B45.1.
    c. Bowl:

        1) Material: Vitreous china.
        2) Type: Siphon jet.
        3) Style: Flushometer tank, gravity.
        4) Height: [Standard]
        5) Rim Contour: Elongated.
        6) Water Consumption: 1.6 gal.
        7) Color: per Owner

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water-supply piping and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing fixture installation.

B. Examine walls and floors for suitable conditions where plumbing fixtures will be installed.

C. Examine counters for suitable conditions where lavatories and sinks will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF COMMERCIAL PLUMBING FIXTURES

A. Lavatory Installation:

1. Install lavatories level and plumb in accordance with roughing-in drawings.
2. Install supports, affixed to building substrate, for wall-mounted lavatories.
3. Install accessible, wall-mounted lavatories at mounting height in accordance with ICC A117.1.
4. Install water-supply piping with stop on each supply to each lavatory faucet. Install stops in locations that are accessible for ease of operation.

5. Install trap and waste piping on each drain outlet of each lavatory to be connected to sanitary drainage system.
6. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 230500 "Common Work Results for Mechanical Systems
7. Seal joints between lavatories, counters, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."
8. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

B. Shower Installation:

1. Assemble shower components in accordance with manufacturers' written instructions.
2. Install showers level and plumb in accordance with roughing-in drawings.
3. Install ball] valves in water-supply piping to the shower if supply stops are specified with the shower valve. Comply with ball[ ] valve requirements specified in Section 220523 "General Duty Valves for Plumbing Piping." Install valves in locations that are accessible for ease of operation.
4. Install shower flow-control fittings with specified maximum flow rates in shower arms.
5. Set shower basins in leveling bed of cement grout.
6. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 230500 "Common Work Results for Mechanical Systems."
7. Seal joints between showers, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

C. Sink Installation:

1. Install sinks level and plumb in accordance with roughing-in drawings.
2. Install supports, affixed to building substrate, for wall-mounted sinks.
3. Install accessible, wall-mounted sinks at mounting height in accordance with ICC A117.1.
4. Set floor-mounted sinks in leveling bed of cement grout.
5. Install water-supply piping with stop on each supply to each sink faucet.
    a. Exception: Use ball or gate valves if supply stops are not specified with sink. Comply with valve requirements specified in Section 220523 "General Duty Valves for Plumbing Piping."

b. Install stops/valves in locations that are accessible for ease of operation.

6. Install trap and waste piping on each drain outlet of each sink to be connected to sanitary drainage system.
7. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 230500 "Common Work Results for Mechanical Systems."
8. Seal joints between sinks, counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."
9. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible sinks. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

D. Water Closet Installation:

1. Install water closets level and plumb in accordance with roughing-in drawings.
2. Install floor-mounted water closets on bowl-to-drain connecting fitting attachments to piping or building substrate.
3. Install accessible, wall-mounted water closets at mounting height in accordance with ICC A117.1.
4. Install supports, affixed to building substrate, for floor-mounted, back-outlet water closets.
5. Use carrier supports with waste-fitting assembly and seal.
6. Install floor-mounted, back-outlet water closets, attached to building floor substrate, onto waste-fitting seals; and attach to support.
7. Install wall-mounted, back-outlet water-closet supports with waste-fitting assembly and waste-fitting seals, and affix to building substrate.
8. Measure support height installation from finished floor, not structural floor.
9. Install flushometer-valve, water-supply fitting on each supply to each water closet.
10. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
11. Install lever-handle flushometer valves for accessible water closets with handle mounted on open side of water closet.
12. Install actuators in locations easily reachable for people with disabilities.
13. Install new batteries in battery-powered, electronic-sensor mechanisms.
14. Install toilet seats on water closets.
15. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Install deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 230500 "Common Work Results for Mechanical Systems."

16. Seal joints between water closets, walls, and floors using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to water-closet color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.3 INSTALLATION OF PIPING CONNECTIONS

A. Connect plumbing fixtures with water supplies and soil, waste, and vent piping. Use size fittings required to match plumbing fixtures.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil, waste, and vent piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

D. Where installing piping adjacent to water closets, allow space for service and maintenance.

3.4 INSTALLATION OF ELECTRICAL CONNECTIONS

A. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

C. Install electrical devices furnished by manufacturer, but not factory mounted in accordance with NFPA 70 and NECA 1.

D. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.

1. Nameplate to be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."
2. Nameplate to be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least 1/2 inch high.

3.5 ADJUSTING

A. Operate and adjust plumbing fixtures and controls. Replace damaged and malfunctioning plumbing fixtures, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow.

C. Adjust water pressure at shower valves to produce proper flow.

D. Adjust water pressure at flushometer valves to produce proper flow.

E. Install new batteries in battery-powered, electronic-sensor mechanisms.

3.6 CLEANING AND PROTECTION

A. After completing installation of plumbing fixtures, inspect and repair damages finishes. Replace any fixtures unable to be repaired to the satisfaction of the Owner.

B. Clean plumbing fixtures and associated faucets, valves, flushometer valves, and fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed plumbing fixtures and associated faucets, valves, flushometer valves, and fittings.

D. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 23 05 00
COMMON WORK RESULTS FOR MECHANICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Motors.
2. Packed expansion joints.
3. Packless expansion joints.
4. Grooved-joint expansion joints.
5. Alignment guides and anchors.
6. Sleeves without waterstop.
7. Sleeves with waterstop.
8. Stack-sleeve fittings.
9. Sleeve-seal systems.
10. Grout.
11. Silicone sealants.
12. Escutcheons.
13. Thermometers, bimetallic actuated.
14. Thermometers, filled system.
15. Thermometers, liquid in glass.
16. Thermometers, light activated.
17. Duct-thermometer mounting brackets.
18. Thermowells.
19. Pressure gauges, dial type.
20. Gauge attachments.
21. Test plugs.
22. Test-plug kits.
23. Sight flow indicators.
24. Flowmeters.
25. Thermal-energy meters.

B. Related Requirements:

1. Section 230923.13 "Energy Meters" for thermal-energy meters connecting with the DDC system.
2. Section 230923.14 "Flow Instruments" for primary flow instruments connecting with the DDC system.

1.2 DEFINITIONS

A. Existing Piping To Remain: Existing piping that is not to be removed and that is not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.3 ACTION SUBMITTALS

A. Product Data:

1. For each type of product, excluding motors which are included in Part 1 of HVAC equipment Sections.
    a. Include construction details, material descriptions, and dimensions of individual components, and finishes.
    b. Include operating characteristics and furnished accessories.

B. Delegated Design Submittals: Seismic restraint for plumbing and mechanical systems, signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data for all serviceable equipment

1.5 QUALITY ASSURANCE

A. Pipe and Pressure-Vessel Welding Qualifications: Qualify procedures and operators in accordance with 2021 ASME Boiler and Pressure Vessel Code, Section IX.

1.6 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 MOTORS

A. Motor Requirements, General:

1. Content includes motors for use on alternating-current power systems of up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.
2. Comply with requirements in this Section except when stricter requirements are specified in equipment schedules or Sections.
3. Comply with NEMA MG 1 unless otherwise indicated.
4. Comply with IEEE 841 for severe-duty motors.

B. Motor Characteristics:

1. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 ft. above sea level.
2. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

C. Polyphase Motors:

1. Description: NEMA MG 1, Design B, medium induction motor.
2. Efficiency: Premium Efficient, as defined in NEMA MG 1.
3. Service Factor: 1.15.
4. Multispeed Motors: Variable torque.
    a. For motors with 2:1 speed ratio, consequent pole, single winding.
    b. For motors with other than 2:1 speed ratio, separate winding for each speed.
5. Multispeed Motors, Two Winding: Separate winding for each speed.
6. Rotor: Random-wound, squirrel cage.
7. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.
8. Temperature Rise: Match insulation rating.
9. Insulation: Class F
10. Code Letter Designation:
    a. Motors 15 Hp and Larger: NEMA starting Code F or Code G.
    b. Motors Smaller Than 15 Hp: Manufacturer's standard starting characteristic.

D. Additional Requirements for Polyphase Motors:

1. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.
2. Motors Used with Variable-Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
    a. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time-rise pulses produced by pulse-width-modulated inverters.
    b. Premium-Efficient Motors: Class B temperature rise; Class F insulation.
    c. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
    d. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.
3. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

E. Single-Phase Motors:

1. Motors larger than 1/20 hp must be one of the following, to suit starting torque and requirements of specific motor application:
    a. Permanent-split capacitor.
    b. Split phase.
    c. Capacitor start, inductor run.
    d. Capacitor start, capacitor run.
2. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
3. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
4. Motors 1/20 hp and Smaller: Shaded-pole type.
5. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device will automatically reset when motor temperature returns to normal range.

2.2 EXPANSION FITTINGS AND LOOPS FOR MECHANICAL PIPING

A. Performance Requirements:

1. Compatibility: Provide products suitable for piping service fluids, materials, working pressures, and temperatures.
2. Capability: Provide products and installations that will accommodate maximum axial movement as scheduled or indicated on Drawings.

3. Flexible-Hose Packless Expansion Joints:
    a. Source Limitations: Obtain flexible-hose packless expansion joints from single manufacturer.
    b. Description: Manufactured assembly with inlet and outlet elbow fittings and two flexible-metal-hose legs joined by long-radius, 180-degree return bend or center section of flexible hose.
    c. Flexible Hose: Corrugated-metal inner hoses and braided outer sheaths.
    d. Expansion Joints for Copper Tubing NPS 2 (DN 50) and Smaller: Copper-alloy fittings with solder-joint end connections.
        1) Bronze hoses and single-braid bronze sheaths with 450 psig at 70 deg F and 340 psig at 450 deg F ratings.
        2) Bronze hoses and double-braid bronze sheaths with 700 psig at 70 deg F and 500 psig at 450 deg F ratings.

2.3 ESCUTCHEONS

A. Provide escutscheons for all piping penetrations through walls and floors and any other architectural features.

2.4 METERS AND GAUGES FOR MECHANICAL PIPING

A. Provide commercial grade meters and gauges as indicated on the drawings. Select products from a single manufacturer and from standard selections. Temperature and pressure ranges shall be selected specifically for the intended service and shall be of the narrowest range suitable for that service.

PART 3 - XECUTION

3.1 INSTALLATION

A. Install mechanical systems in an orderly and professional manner, consistent with industry standards and best practice. Install all equipment in accordance with manufacturer’s written instructions, including testing and adjustments.

3.2 CONNECTIONS

A. Install meters and gauges adjacent to machines and equipment to allow space for service and maintenance of meters, gauges, machines, and equipment.

B. Connect flowmeter-system elements to meters.

C. Connect flowmeter transmitters to meters.

D. Connect thermal-energy meter transmitters to meters.

3.3 ADJUSTING

A. After installation, calibrate meters according to manufacturer's written instructions.

B. Adjust faces of meters and gauges to proper angle for best visibility.

3.4 FIELD QUALITY CONTROL

A. Sleeves and Sleeve Seals:

1. Perform the following tests and inspections:
    a. Leak Test: After allowing for a full cure, test sleeves and sleeve seals for leaks. Repair leaks and retest until no leaks exist.
    b. Sleeves and sleeve seals will be considered defective if they do not pass tests and inspections.
2. Prepare test and inspection reports.

B. Escutcheons:

1. Using new materials, replace broken and damaged escutcheons and floor plates.

END OF SECTION

SECTION 23 05 29
HANGERS AND SUPPORTS FOR MECHANICAL PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Fiberglass pipe hangers.
4. Metal framing systems.
5. Fiberglass strut systems.
6. Thermal hanger-shield inserts.
7. Fastener systems.
8. Pipe stands.
9. Pipe-positioning systems.
10. Equipment supports.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Section 230500 "Common Work Results for Mechanical Systems.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:

1. Trapeze pipe hangers.
2. Metal framing systems.
3. Fiberglass strut systems.
4. Pipe stands.
5. Equipment supports.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Hangers and supports for 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.
3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

2.2 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: Pre-galvanized, hot-dip galvanized, or electro-galvanized.
3. Nonmetallic Coatings: Plastic coated or epoxy powder coated.
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. Copper Pipe and Tube 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 stainless steel

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-58, 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.

PART 3 - EXECUTION

3.1 APPLICATION

A. Strength of 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.

3.2 INSTALLATION OF HANGERS AND SUPPORTS

A. Metal Pipe-Hanger Installation: Comply with MSS SP-58. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. 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. MSS SP-58, Type 39: Install 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. MSS SP-58, Type 40: Install 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 (DN 8 to DN 90): 12 inches long and 0.048 inch thick.
5. Thermal Hanger Shields: Install with insulation of same thickness as piping insulation.

3.3 INSTALLATION OF 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.

3.4 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for equipment supports.

B. 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.

3.5 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**

3.6 PAINTING

A. Touchup:

1. Clean field welds and abraded, shop-painted areas. Paint exposed areas immediately after erecting hangers and supports. Use same materials as those used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
    a. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas, and apply galvanizing-repair paint to comply with ASTM A780/A780M.

3.7 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-58 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 finishes.

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 copper-plated pipe hangers and stainless steel attachments for copper piping and tubing.

G. Use padded hangers for piping that is subject to scratching.

H. Use thermal hanger-shield inserts for insulated piping and tubing.

I. 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 occurs.
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 occurs.
19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction occurs but vertical adjustment is unnecessary.
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 occurs and vertical adjustment is unnecessary.
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, in addition to expansion and contraction, is required.

J. 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.

K. 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 of 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.

L. 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.

M. 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.

N. 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.

O. Comply with MSS SP-58 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

END OF SECTION

SECTION 23 05 93
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Testing, Adjusting, and Balancing of Air Systems:
    a. Constant-volume air systems.
2. Testing, Adjusting, and Balancing of Hydronic Piping Systems:
    a. Constant-flow hydronic systems.
    b. Variable-flow hydronic systems.
    c. Primary-secondary hydronic systems.
3. Testing, adjusting, and balancing of fuel oil systems for HVAC.
4. Testing, adjusting, and balancing of equipment.
5. Procedures for exhaust hoods.
6. HVAC-control system verification.

1.3 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. NEBB: National Environmental Balancing Bureau.

C. TAB: Testing, adjusting, and balancing.

D. TABB: Testing, Adjusting, and Balancing Bureau.

E. TAB Specialist: An independent entity meeting qualifications to perform TAB work.

F. TDH: Total dynamic head.

1.4 PREINSTALLATION MEETINGS

1. Minimum Agenda Items:
    a. The Contract Documents examination report.
    b. The TAB plan.
    c. Needs for coordination and cooperation of trades and subcontractors.
    d. Proposed procedures for documentation and communication flow.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB specialist and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Contract Documents Examination Report: Within 30 days of Contractor's Notice to Proceed, submit the Contract Documents review report, as specified in Part 3.

C. System Readiness Checklists: Within 30 days of Contractor's Notice to Proceed, submit system readiness checklists, as specified in "Preparation" Article.

D. Examination Report: Submit a summary report of the examination review required in "Examination" Article.

E. Certified TAB reports.

F. Instrument calibration reports, to include the following:

1. Instrument type and make.
2. Serial number.
3. Application.
4. Dates of use.
5. Dates of calibration.

1.6 QUALITY ASSURANCE

A. TAB Specialists Qualifications, Certified by AABC:

1. TAB Field Supervisor: Employee of the TAB specialist and certified by AABC.
2. TAB Technician: Employee of the TAB specialist and certified by AABC.

B. TAB Specialists Qualifications, Certified by NEBB.

1. TAB Field Supervisor: Employee of the TAB specialist and certified by NEBB.

2. TAB Technician: Employee of the TAB specialist and certified by NEBB.

C. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."

D. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.7.2.3 - "System Balancing."

E. Code and AHJ Compliance: TAB is required to comply with governing codes and requirements of authorities having jurisdiction.

1.7 FIELD CONDITIONS

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 TAB SPECIALISTS

3.2 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.

B. Examine installed systems for balancing devices, such as test ports, gauge cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data, including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine equipment performance data, including fan and pump curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions

used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

F. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

G. Examine test reports specified in individual system and equipment Sections.

H. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.

I. Examine terminal units, and verify that they are accessible and their controls are connected and functioning.

J. Examine temporary and permanent strainers. Verify that temporary strainer screens used during system cleaning and flushing have been removed and permanent strainer baskets are installed and clean.

K. Examine control valves for proper installation for their intended function of isolating, throttling, diverting, or mixing fluid flows.

L. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

M. Examine system pumps to ensure absence of entrained air in the suction piping.

N. Examine operating safety interlocks and controls on HVAC equipment.

O. Examine control dampers for proper installation for their intended function of isolating, throttling, diverting, or mixing air flows.

P. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.3 PREPARATION

A. Prepare a TAB plan that includes the following:

1. Equipment and systems to be tested.
2. Strategies and step-by-step procedures for balancing the systems.
3. Instrumentation to be used.
4. Sample forms with specific identification for all equipment.

B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:

1. Airside:
   a. Duct systems are complete with terminals installed.
   b. Volume, smoke, and fire dampers are open and functional.
   c. Clean filters are installed.
   d. Fans are operating, free of vibration, and rotating in correct direction.
   e. Automatic temperature-control systems are operational.
   f. Ceilings are installed.
   g. Windows and doors are installed.
   h. Suitable access to balancing devices and equipment is provided.

2. Hydronics:
   a. Verify pressure tests on water distribution systems have been satisfactorily completed.
   b. Piping is complete with terminals installed.
   c. Water treatment is complete.
   d. Systems are flushed, filled, and air purged.
   e. Strainers are pulled and cleaned.
   f. Control valves are functioning in accordance with the sequence of operation.
   g. Shutoff and balance valves have been verified to be 100 percent open.
   h. Pumps are started and proper rotation is verified.
   i. Pump gauge connections are installed directly at pump inlet and outlet flanges or in discharge and suction pipe prior to valves or strainers.
   j. Variable-frequency controllers' startup is complete and safeties are verified.
   k. Suitable access to balancing devices and equipment is provided.

3.4 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system in accordance with the procedures contained in AABC's "National Standards for Total System Balance" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.

B. Cut insulation, ducts, pipes, and equipment casings for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
2. Where holes for probes are required in piping or hydronic equipment, install pressure and temperature test plugs to seal systems.
3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP).

3.5 TESTING, ADJUSTING, AND BALANCING OF HVAC EQUIPMENT

A. Test, adjust, and balance HVAC equipment indicated on Drawings, including, but not limited to, the following:
   1. Motors.
   2. Pumps.
   3. Fans and ventilators.
   4. Boilers.
   5. Radiant heaters.
   6. Unit heaters.
   7. Condensing units.
   8. Sanitary vacuum pump units.
   9. Finned-tube radiation heaters.

3.6 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' Record drawings duct layouts.

C. For variable-air-volume systems, develop a plan to simulate diversity.

D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

G. Verify that motor starters are equipped with properly sized thermal protection.

H. Check dampers for proper position to achieve desired airflow path.

I. Check for airflow blockages.

J. Check condensate drains for proper connections and functioning.

K. Check for proper sealing of air-handling-unit components.

3.7 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.
    a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
    b. Where duct conditions allow, measure airflow by main Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses close to the fan and prior to any outlets, to obtain total airflow.
    c. Where duct conditions are unsuitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.

2. Measure fan static pressures as follows:
    a. Measure static pressure directly at the fan outlet or through the flexible connection.
    b. Measure static pressure directly at the fan inlet or through the flexible connection.
    c. Measure static pressure across each component that makes up the air-handling system.
    d. Report artificial loading of filters at the time static pressures are measured.

3. Review Contractor-prepared shop drawings and Record drawings to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
4. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.

1. Measure airflow of submain and branch ducts.

2. Adjust submain and branch duct volume dampers for specified airflow.
3. Re-measure each submain and branch duct after all have been adjusted.

C. Adjust air inlets and outlets for each space to indicated airflows.

1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
2. Measure inlets and outlets airflow.
3. Adjust each inlet and outlet for specified airflow.
4. Re-measure each inlet and outlet after they have been adjusted.

D. Verify final system conditions.

1. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to design if necessary.
2. Re-measure and confirm that total airflow is within design.
3. Re-measure all final fan operating data, speed, volts, amps, and static profile.
4. Mark all final settings.
5. Measure and record all operating data.
6. Record final fan-performance data.

3.8 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports for pumps, coils, and other equipment. Obtain approved submittals and manufacturer-recommended testing procedures. Crosscheck the summation of required coil and equipment flow rates with pump design flow rate.

B. Prepare schematic diagrams of systems' Record drawings piping layouts.

C. In addition to requirements in "Preparation" Article, prepare hydronic systems for testing and balancing as follows:

1. Check expansion tank for proper setting.
2. Check highest vent for adequate pressure.
3. Check flow-control valves for proper position.
4. Locate start-stop and disconnect switches, electrical interlocks, and motor controllers.
5. Verify that motor controllers are equipped with properly sized thermal protection.
6. Check that air has been purged from the system.

D. Measure and record upstream and downstream pressure of each piece of equipment.

E. Measure and record upstream and downstream pressure of pressure-reducing valves.

F. Check settings and operation of automatic temperature-control valves, self-contained control valves, and pressure-reducing valves. Record final settings.

1. Check settings and operation of each safety valve. Record settings.

3.9 PROCEDURES FOR HYDRONIC SYSTEMS

A. Adjust pumps to deliver total design flow.

1. Measure total water flow.

a. Position valves for full flow through coils.
b. Measure flow by main flow meter, if installed.
c. If main flow meter is not installed, determine flow by pump TDH or known equipment pressure drop.

2. Measure pump TDH as follows:

a. Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
b. Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
c. Convert pressure to head and correct for differences in gauge heights.
d. Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow, and verify that the pump has the intended impeller size.
e. With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved. If excessive throttling is required to achieve desired flow, recommend pump impellers be trimmed to reduce excess throttling.

3. Monitor motor performance during procedures, and do not operate motor in an overloaded condition.

B. Verify final system conditions as follows:

1. Re-measure and confirm that total water flow is within design.
2. Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
3. Mark final settings.

C. Verify that memory stops have been set.

3.10 PROCEDURES FOR MOTORS

A. Motors 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Phase and hertz.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter size and thermal-protection-element rating.
8. Service factor and frame size.

3.11 PROCEDURES FOR AIR-COOLED CONDENSING UNITS

A. Verify proper rotation of fan(s).

B. Measure and record entering- and leaving-air temperatures.

C. Measure and record entering and leaving refrigerant pressures.

D. Measure and record operating data of compressor(s), fan(s), and motors.

3.12 PROCEDURES FOR BOILERS

A. Hydronic Boilers:

1. Measure and record entering- and leaving-water temperatures.
2. Measure and record water flow.
3. Measure and record pressure drop.
4. Measure and record relief valve(s) pressure setting.
5. Capacity: Calculate in Btu/h of heating output.
6. Fuel Consumption: If boiler fuel supply is equipped with flow meter, measure and record consumption.
7. Efficiency: Calculate operating efficiency for comparison to submitted equipment.
8. Fan, motor, and motor controller operating data.

3.13 TOLERANCES

A. Set HVAC system's airflow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent if design value is less than 100 cfm, within 10 cfm.

2. Air Outlets and Inlets: Plus or minus 10 percent if design value is less than 100 cfm, within 10 cfm.
3. Heating-Water Flow Rate: Plus or minus 10 percent if design value is less than 10 gpm, within 10 percent.
4. Chilled-Water Flow Rate: Plus or minus 10 percent if design value is less than 10 gpm, within 10 percent.
5. Condenser-Water Flow Rate: Plus or minus 10 percent.

B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.14 PROGRESS REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for system-balancing devices. Recommend changes and additions to system-balancing devices, to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance-measuring and -balancing devices.

3.15 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.
3. Certify validity and accuracy of field data.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Pump curves.
2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance; do not include Shop Drawings and Product Data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.

2. Name and address of the TAB specialist.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents, including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.
15. Test conditions for fans performance forms, including the following:

    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Fan drive settings, including settings and percentage of maximum pitch diameter.
    d. Settings for pressure controller(s).
    e. Other system operating conditions that affect performance.

16. Test conditions for pump performance forms, including the following:

    a. Variable-frequency controller settings for variable-flow hydronic systems.
    b. Settings for pressure controller(s).
    c. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Water flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.
7. Position of balancing devices.

8. Motor Data:
    a. Motor make, and frame type and size.
    b. Horsepower and speed.
    c. Volts, phase, and hertz.
    d. Full-load amperage and service factor.
    e. Sheave make, size in inches, and bore.
    f. Center-to-center dimensions of sheave and amount of adjustments in inches.
9. Test Data (Indicated and Actual Values):
    a. Total airflow rate in cfm.
    b. Total system static pressure in inches wg.
    c. Fan speed.
    d. Inlet and discharge static pressure in inches wg.
    e. For each filter bank, filter static-pressure differential in inches wg.
    f. List for each internal component with pressure-drop, static-pressure differential in inches wg.
    g. Outdoor airflow in cfm.
    h. Outdoor-air damper position.
    i. Relief-air damper position.

E. Oil-Fired Heat Apparatus Test Reports: In addition to manufacturer's factory startup equipment reports, include the following:
1. Unit Data:
    a. System identification.
    b. Location.
    c. Make and type.
    d. Model number and unit size.
    e. Manufacturer's serial number.
    f. Fuel type in input data.
    g. Output capacity in Btu/h.
    h. Ignition type.
    i. Burner-control types.
    j. Motor horsepower and speed.
    k. Motor volts, phase, and hertz.
    l. Motor full-load amperage and service factor.
    m. Sheave make, size in inches, and bore.
    n. Center-to-center dimensions of sheave and amount of adjustments in inches.
2. Test Data (Indicated and Actual Values):
    a. Total airflow rate in cfm.
    b. Entering-air temperature in deg F.
    c. Leaving-air temperature in deg F.
    d. Air temperature differential in deg F.

e. Entering-air static pressure in inches wg.
f. Leaving-air static pressure in inches wg.
g. Air static-pressure differential in inches wg.
h. Low-fire fuel input in Btu/h.
i. High-fire fuel input in Btu/h.
j. Manifold pressure in psig.
k. High-temperature-limit setting in deg F.
l. Operating set point in Btu/h.
m. Motor voltage at each connection.
n. Motor amperage for each phase.
o. Heating value of fuel in Btu/h.

F. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

a. System identification.
b. Location.
c. Make and type.
d. Model number and size.
e. Manufacturer's serial number.
f. Arrangement and class.
g. Sheave make, size in inches, and bore.
h. Center-to-center dimensions of sheave and amount of adjustments in inches.

2. Motor Data:

a. Motor make, and frame type and size.
b. Horsepower and speed.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Center-to-center dimensions of sheave and amount of adjustments in inches.
g. Number, make, and size of belts.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan speed.
d. Discharge static pressure in inches wg.
e. Suction static pressure in inches wg.

G. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

a. System fan and air-handling-unit number.
b. Location and zone.
c. Traverse air temperature in deg F.
d. Duct static pressure in inches wg.
e. Duct size in inches.
f. Duct area in sq. ft..
g. Indicated airflow rate in cfm.
h. Indicated velocity in fpm.
i. Actual airflow rate in cfm.
j. Actual average velocity in fpm.
k. Barometric pressure in psig.

2. Test Data (Indicated and Actual Values):

a. Airflow rate in cfm.
b. Air velocity in fpm.
c. Preliminary airflow rate as needed in cfm.
d. Preliminary velocity as needed in fpm.
e. Final airflow rate in cfm.
f. Final velocity in fpm.
g. Space temperature in deg F.

H. Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves, and include the following:

1. Unit Data:

a. Unit identification.
b. Location.
c. Service.
d. Make and size.
e. Model number and serial number.
f. Water flow rate in gpm.
g. Water pressure differential in feet of head or psig.
h. Required net positive suction head in feet of head or psig.
i. Pump speed.
j. Impeller diameter in inches.
k. Motor make and frame size.
l. Motor horsepower and rpm.
m. Voltage at each connection.
n. Amperage for each phase.
o. Full-load amperage and service factor.
p. Seal type.

2. Test Data (Indicated and Actual Values):

a. Static head in feet of head or psig.
b. Pump shutoff pressure in feet of head or psig.
c. Actual impeller size in inches.

d. Full-open flow rate in gpm.
e. Full-open pressure in feet of head or psig.
f. Final discharge pressure in feet of head or psig.
g. Final suction pressure in feet of head or psig.
h. Final total pressure in feet of head or psig.
i. Final water flow rate in gpm.
j. Voltage at each connection.
k. Amperage for each phase.

I. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

3.16 VERIFICATION OF TAB REPORT

A. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of Owner.

B. Prepare test and inspection reports.

END OF SECTION

SECTION 23 07 19
HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes insulation for HVAC piping systems.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied, if any).

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or craft training program, certified by the Department of Labor, Bureau of Apprenticeship and Training.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation system materials are to be delivered to the Project site in unopened containers. The packaging is to include name of manufacturer, fabricator, type, description, and size, as well as ASTM standard designation, and maximum use temperature.

1.6 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 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.

1.7 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.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products in accordance with ASTM E84 by a testing agency acceptable to authority having jurisdiction. Factory label insulation, jacket materials, adhesive, mastic, tapes, and cement material containers with appropriate markings of applicable testing agency.

1. All Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

2.2 INSULATION MATERIALS

A. Products do not contain asbestos, lead, mercury, or mercury compounds.

B. Products that come into contact with stainless steel have a leachable chloride content of less than 50 ppm when tested in accordance with ASTM C871.

C. Insulation materials for use on austenitic stainless steel are qualified as acceptable in accordance with ASTM C795.

D. Foam insulation materials do not use CFC or HCFC blowing agents in the manufacturing process.

E. Calcium Silicate: Preformed Pipe Sections: Flat-, curved-, and grooved-block sections of noncombustible, inorganic, hydrous calcium silicate with a non-asbestos fibrous reinforcement. Comply with ASTM C533, Type I.

   1. Prefabricated Fitting Covers: Comply with ASTM C450 and ASTM C585 for dimensions used in preforming insulation to cover valves, elbows, tees, and flanges.

F. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Comply with ASTM C552.

   1. Preformed Pipe Insulation with Jacket: Type II, Class 2, with factory-applied ASJ jacket.
   2. Fabricated shapes in accordance with ASTM C450, ASTM C585, and ASTM C1639.

G. Cold Water Piping: Use Flexible Elastomeric: Closed-cell, or expanded-rubber materials; suitable for maximum use temperature between minus 70 deg F and 220 deg F. Comply with ASTM C534/C534M, Type I, for tubular materials, Type II for sheet materials.

H. For Hot Water and Heating Piping: Use Glass-Fiber, Preformed Pipe: Glass fibers bonded with a thermosetting resin; suitable for maximum use temperature up to 850 deg F in accordance with ASTM C411. Comply with ASTM C547.

   1. Preformed Pipe Insulation: Type I, Grade A with factory-applied ASJ.
   2. Fabricated shapes in accordance with ASTM C450 and ASTM C585.

2.3 MASTICS AND COATINGS

A. Materials shall be compatible with insulation materials, jackets, and substrates.

2.4 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 C1136, Type I.

2.5 FIELD-APPLIED JACKETS

A. Field-applied jackets comply with ASTM C1136, Type I, unless otherwise indicated.

PART 3 - EXECUTION

3.1 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.

3.2 PREPARATION

A. Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

C. Coordinate insulation installation with the installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

3.3 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 of 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, compress, or otherwise damage insulation or jacket.

D. Install insulation with longitudinal seams at top and bottom (12 o'clock and 6 o'clock positions) 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 storage, application, and finishing. Replace insulation materials that get wet during storage or in the installation process before being properly covered and sealed in accordance with the Contract Documents unless otherwise approved by the engineer of record.

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 attached to structure with vapor-barrier mastic.
    3. Install insert materials and 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. Install insulation with factory-applied jackets as follows:

    1. Draw jacket tight and smooth, but not to the extent of creating wrinkles or areas of compression in the insulation.
    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.
    4. For below-ambient services, apply vapor-barrier mastic over staples.
    5. Cover joints and seams with tape, in accordance with insulation material manufacturer's written instructions, to maintain vapor seal.

6. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

L. Cut insulation in a manner to avoid compressing insulation.

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 in similar fashion to butt joints.

O. 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.

3.4 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 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.

C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

E. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies.

3.5 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 below.

3.6 INSTALLATION OF CELLULAR-GLASS INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of 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 jackets on above-ambient services, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with jackets on below-ambient services, 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 Fittings and Elbows:

1. Install prefabricated sections of same material as that of straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered or routed sections of cellular-glass insulation. Secure insulation materials with wire or bands.

C. Insulation Installation on Valves and Pipe Specialties:

1. Not required.

3.7 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Fittings and Elbows:

1. Install sections of pipe insulation and miter if required in accordance with manufacturer's written instructions.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Valves and Pipe Specialties:

1. Install prefabricated valve covers manufactured of same material as that of pipe insulation when available.
2. When prefabricated valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties, and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation

3.8 PIPING INSULATION SCHEDULE, GENERAL

A. Insulation conductivity and thickness per pipe size comply with schedules in this Section or with requirements of authorities having jurisdiction, whichever is more stringent.

B. 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.

3.9 INDOOR PIPING INSULATION SCHEDULE

A. Condensate and Equipment Drain Water below 60 Deg F:

1. All Pipe Sizes: Insulation is the following:
    a. Flexible Elastomeric: 1 inch thick.

B. Heating-Hot-Water Supply and Return, 200 Deg F and Below:

1. NPS 4 and Smaller: Insulation is the following:
    a. Glass-Fiber, Preformed Pipe, Type I: 1 inch thick.

C. Refrigerant Suction and Hot-Gas Piping:

1. Provide and install in accordance with freezer manufacturer's written instructions.

END OF SECTION

SECTION 23 11 13

FACILITY FUEL-OIL PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fuel-oil pipes, tubes, and fittings.
2. Double-containment pipe and fittings.
3. Piping specialties.
4. Joining materials.
5. Specialty valves.
6. Mechanical leak-detection valves.
7. Leak-detection and monitoring system.
8. Labels and identification.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, and dimensions of individual components and profiles.
2. Include rated capacities, pressure ratings, operating characteristics, electrical characteristics, settings, and furnished specialties and accessories.

B. Delegated Design Submittals: For fuel-oil piping supports and seismic restraints indicated to comply with performance requirements and design criteria.

1. Include analysis data[signed and sealed by the qualified professional engineer responsible for their preparation].
2. Detail fabrication and assembly of anchors and seismic restraints.
3. Design Calculations: Calculate requirements for selecting seismic restraints.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fuel-oil equipment and accessories.

1. Indicate actual installed items by marking submittals with an arrow or box.

1.4 QUALITY ASSURANCE

A. Delegated Design Engineer Qualifications: A professional engineer who is legally qualified to practice in the state where Project is located and who is experienced in providing engineering services of the type indicated.

B. Brazing: Qualify processes and operators in accordance with ASME Boiler and Pressure Vessel Code: Section IX.

C. Steel Support Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Pipe Welding Qualifications: Qualify procedures and personnel in accordance with ASME Boiler and Pressure Vessel Code.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Lift and support fuel-oil storage tanks only at designated lifting or supporting points, as indicated on Shop Drawings. Do not move or lift tanks unless empty.

B. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and use.

B. Comply with ASME B31.9, "Building Services Piping," for fuel-oil piping materials, installation, testing, and inspecting.

C. Fuel-Oil Valves: Comply with UL 842 and have service mark initials "WOG" permanently marked on valve body.

D. Comply with requirements of the EPA and of state and local authorities having jurisdiction.

E. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design vibration isolation, supports, anchors and seismic restraints for fuel-oil piping

F. Seismic Performance: Fuel-oil piping and associated components to withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
2. Component Importance Factor: 1.0.

2.2 FUEL-OIL PIPES, TUBES, AND FITTINGS

A. Steel Pipe: ASTM A53/A53M, black steel, Schedule 40, Type E or S, Grade B.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
2. Wrought-Steel Welding Fittings: ASTM A234/A234M, for butt and socket welding.
3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
4. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

    a. Material Group: 1.1.
    b. End Connections: Threaded or butt welding to match pipe.
    c. Lapped Face: Not permitted underground.
    d. Gasket Materials: Asbestos free, ASME B16.20 metallic, or ASME B16.21 nonmetallic; gaskets compatible with fuel oil.
    e. Bolts and Nuts: ASME B18.2.1, zinc alloy-plated steel.

B. Drawn-Temper Copper Tube: Comply with ASTM B88, Type L.

1. Copper Fittings: ASME B16.22, wrought copper, streamlined pattern.
2. Bronze Flanges and Flanged Fittings: ASME B16.24, Class 150.

    a. Gasket Material: Asbestos free, ASME B16.20 metallic or ASME B16.21 nonmetallic; gaskets compatible with fuel oil.
    b. Bolts and Nuts: ASME B18.2.1, zinc alloy-plated steel.

C. Annealed-Temper Copper Tube: Comply with ASTM B88, Type L.

1. Copper Fittings: ASME B16.22, wrought copper, streamlined pattern.

2. Flare Fittings: Comply with ASME B16.26 and SAE J513.
    a. Copper fittings with long nuts.
    b. Metal-to-metal compression seal without gasket.
    c. Dryseal threads complying with ASME B1.20.3.

2.3 PIPING SPECIALTIES

A. Strainers - Y-Pattern:

1. Body: ASTM A126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3. Strainer Screen: 6080-mesh startup strainer and perforated stainless steel basket with 50 percent free area.
4. CWP Rating: 125 psig.

B. Air Vents - Manual:

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

2.4 JOINING MATERIALS

A. Joint Compound and Tape for Threaded Joints: Suitable for fuel oil.

B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

C. Brazing Filler Metals: Alloy with melting point greater than 1000 deg F complying with AWS A5.8/A5.8M. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

D. Bonding Adhesive for RTRP and RTRF: As recommended by piping and fitting manufacturer.

2.5 SPECIALTY VALVES

A. Pressure Relief Valves:

1. Source Limitations: Obtain pressure relief valves from single manufacturer.
2. Listed and labeled for fuel-oil service by an NRTL acceptable to authorities having jurisdiction.
3. Body: Brass, bronze, or cast steel.
4. Springs: Stainless steel, interchangeable.
5. Seat and Seal: NBR.
6. Orifice: Stainless steel, interchangeable.
7. Factory-Applied Finish: Baked enamel.
8. Maximum Inlet Pressure: 150 psig
9. Relief Pressure Setting: 60 psig

B. Oil Safety Valves:

1. Source Limitations: Obtains oil safety valves from single manufacturer.
2. Listed and labeled for fuel-oil service by an NRTL acceptable to authorities having jurisdiction.
3. Body: Brass, bronze, or cast steel.
4. Springs: Stainless steel.
5. Seat and Diaphragm: NBR.
6. Orifice: Stainless steel, interchangeable.
7. Factory-Applied Finish: Baked enamel.
8. Manual override port.
9. Maximum Inlet Pressure: 60 psig
10. Maximum Outlet Pressure: 3 psig

C. Emergency Shutoff Valves:

1. Source Limitations: Obtain emergency shutoff valves from single manufacturer.
2. Listed and labeled for fuel-oil service by an NRTL acceptable to authorities having jurisdiction.
3. Double poppet valve.
4. Body: ASTM A126, cast iron.
5. Disk: FPM.
6. Poppet Spring: Stainless steel.
7. Stem: Plated brass.
8. O-Ring: FPM.
9. Packing Nut: PTFE-coated brass.
10. Fusible link to close valve at 165 deg F.
11. Thermal relief to vent line pressure buildup due to fire.
12. Air test port.
13. Maximum Operating Pressure: 0.5 psig.

2.6 LEAK-DETECTION AND MONITORING SYSTEM

A. Cable and Sensor Leak-Detection Monitoring System:

1. Source Limitations: Obtain cable and sensor leak-detection monitoring system from single manufacturer.
2. Standard: Comply with UL 1238.
3. Calibrated leak-detection and monitoring system with probes and other sensors and remote alarm panel for fuel-oil piping.
4. Include fittings and devices required for testing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas for compliance with requirements for installation tolerances and other conditions affecting performance of fuel-oil piping.

B. Examine installation of fuel-burning equipment and fuel-handling and storage equipment to verify actual locations of piping connections before installing fuel-oil piping.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Close equipment shutoff valves before turning off fuel oil to premises or piping section.

B. Comply with NFPA 30 and NFPA 31 requirements for prevention of accidental ignition.

3.3 INSTALLATION OF OUTDOOR PIPING

A. Steel Piping with Protective Coating:

1. Apply joint cover kits to pipe after joining, to cover, seal, and protect joints.
2. Repair damage to PE coating on pipe, complying with protective coating manufacturer's written instructions. Review protective coating damage with Architect prior to repair.
3. Replace pipe having damaged PE coating with new pipe.

B. Install double-containment, fuel-oil pipe at a minimum slope of 1 percent downward toward fuel-oil storage tank sump.

C. Install vent pipe at a minimum slope of 2 percent downward toward fuel-oil storage tank sump.

D. Assemble and install entry boots for pipe penetrations through sump sidewalls for liquid tight joints.

E. Install metal pipes and tubes, fittings, valves, and flexible connectors at piping connections to aboveground storage tanks and underground storage tanks.

F. Install fittings for changes in direction in rigid pipe.

G. Install system components with pressure rating equal to or greater than system operating pressure.

3.4 INSTALLATION OF INDOOR PIPING

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. 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. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction to allow for mechanical installations.

C. Install piping in concealed locations unless otherwise indicated 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 at a height that allows sufficient space for ceiling panel removal.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Comply with requirements for equipment specifications for roughing-in requirements.

I. Conceal pipe installations in walls, pipe spaces, or utility spaces; above ceilings; below grade or floors; and in floor channels unless indicated to be exposed to view.

J. Prohibited Locations:

1. Do not install fuel-oil piping in or through HVAC ducts and plenums, clothes or trash chutes, chimneys, or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
2. Do not install fuel-oil piping in solid walls or partitions.

K. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

L. Connect branch piping from top or side of horizontal piping.

M. Install unions in pipes NPS 2 and smaller at final connection to each piece of equipment and elsewhere as indicated. Unions are not required on flanged devices.

N. Do not use fuel-oil piping as grounding electrode.

O. Install sleeves and sleeve seals for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230500 "Common Work Results for Mechanical Systems."

P. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230500 "Common Work Results for Mechanical Systems."

3.5 INSTALLATION OF VALVES

A. Install manual fuel-oil shutoff valves on branch connections to fuel-oil appliance.

B. Install valves in accessible locations.

C. Install oil safety valves at inlet of each oil-fired appliance.

D. Install pressure relief valves in distribution piping between the supply and return lines.

E. Install manual air vents at high points in fuel-oil piping.

F. Install emergency shutoff valves at dispensers.

3.6 PIPING JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads in accordance with ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

   1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
   2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints: Construct joints in accordance with AWS D10.12/D10.12M, using qualified processes and welding operators in accordance with "Quality Assurance" Article.

   1. Bevel plain ends of steel pipe.
   2. Patch factory-applied protective coating as recommended in writing by manufacturer at field welds and where damage to coating occurs during construction.

E. Brazed Joints: Construct joints in accordance with AWS's "Brazing Handbook," Ch. 35, "Pipe and Tubing."

F. Flanged Joints: Install gasket material, size, type, and thickness for service application. Install gasket concentrically positioned.

G. Flared Joints: Comply with SAE J513. Tighten finger tight, and then use wrench in accordance with fitting manufacturer's written instructions. Do not overtighten.

H. Fiberglass-Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join in accordance with pipe manufacturer's written instructions.

3.7 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for hangers, supports, and anchor devices specified in Section 230529 "Hangers and Supports for Mechancial Piping and Equipment."

B. Install hangers for steel piping and copper tubing, with maximum horizontal spacing and minimum rod diameters, to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

C. Support horizontal piping within 12 inches of each fitting and coupling.

D. Support vertical runs of steel piping to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.8 INSTALLATION OF LEAK-DETECTION AND MONITORING SYSTEM

A. Install leak-detection and monitoring system. Install alarm panel inside building; coordinate location with building owner.

3.9 PIPING CONNECTIONS

A. Where installing piping adjacent to equipment, allow space for service and maintenance.

B. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment having threaded pipe connection.

C. Connect piping to equipment with shutoff valve and union. Install union between valve and equipment.

D. Install flexible piping connectors at final connection to burners, oil-fired appliances, and day tanks.

3.10 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Piping Pressure Test: Minimum hydrostatic or pneumatic test-pressures measured at highest point in system.
    a. Fuel-Oil Distribution Piping:
        1) Hydrostatic: Minimum 150 percent of maximum anticipated pressure or 5 psig, whichever is greater
        2) Pneumatic: Minimum 110 percent of maximum anticipated pressure.
        3) Pressure to be maintained while complete visual inspection of all joints and connections is conducted.
        4) In no case is test pressure to be less than a gauge pressure of 5 psi measured at the highest point of the system.
        5) In no case is test pressure to be maintained for less than 10 minutes.
    b. Suction Piping: Minimum 20 in. Hg for minimum 30 minutes.
    c. Isolate storage tanks if test pressure in piping will cause pressure in storage tanks to exceed 10 psig.

B. Inspect and test fuel-oil piping in accordance with NFPA 31, "Tests of Piping" Paragraph; and in accordance with requirements of authorities having jurisdiction.

C. Test leak-detection and monitoring system for accuracy by manually operating sensors and checking against alarm panel indication.

D. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Bleed air from fuel-oil piping using manual air vents.

F. Fuel-oil piping and equipment will be considered defective if they do not pass tests and inspections.

G. Prepare test and inspection reports.

3.11 OUTDOOR PIPING SCHEDULE

A. Aboveground fuel-oil piping to be the following:

1. NPS 2 (DN 50) Pipe Size and Smaller: Steel pipe, steel or malleable-iron threaded fittings, and threaded joints.

3.12 INDOOR PIPING SCHEDULE

A. Aboveground fuel-oil piping to be the following:

1. NPS 1/2 (DN 15) Pipe Size and Smaller: Steel pipe with threaded joints or annealed-temper copper pipe, wrought copper fittings, and brazed or flared joints.
2. NPS 5/8 to NPS 2 (DN 18 to DN 50): Steel pipe, steel or malleable-iron threaded fittings, and threaded joints

3.13 SHUTOFF VALVE SCHEDULE

A. Valves for aboveground distribution piping NPS 2 (DN 50) and smaller to be the following:

1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, full port, bronze ball valves with bronze trim.

B. Valves in branch piping for single appliance to be the following:

1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, full port, bronze ball valves with bronze trim.

END OF SECTION

SECTION 23 13 23
FACILITY ABOVEGROUND FUEL-OIL STORAGE TANKS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Aboveground fuel-oil storage tanks, horizontal, steel.
2. Aboveground fuel-oil storage tank, shop painting.
3. Aboveground fuel-oil storage tank accessories.
4. Fuel-oil-level gauge system.
5. Fuel-oil leak-detection and monitoring systems.
6. Fuel oil.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, and dimensions of individual components and profiles.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
3. Fuel-oil storage tank accessories.
4. Fuel-oil leak-detection and monitoring system.

1.3 INFORMATIONAL SUBMITTALS

A. Site Survey: Plans, drawn to scale, on which fuel-oil storage tanks are indicated and coordinated with other services and utilities.

B. Seismic Qualification Data: Certificates for aboveground fuel oil storage tanks, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Field quality-control reports.

D. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

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

1.5 QUALITY ASSURANCE

A. Steel Support Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Lift and support fuel-oil storage tanks only at designated lifting or supporting points, as shown on Shop Drawings. Do not move or lift tanks unless empty.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of fuel-oil storage tanks that fail in materials or workmanship within specified warranty period.

1. Storage Tanks:

a. Failures include, but are not limited to, the following when used for storage of fuel oil at temperatures not exceeding 150 deg F including cracking, breakup, and collapse.

1) Corrosion failure including external and internal corrosion of steel tanks.

b. Warranty Period: 1 year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design restraint and anchors for aboveground fuel-oil storage tanks and equipment, including comprehensive engineering analysis, using performance requirements and design criteria indicated.

B. Seismic Performance: Factory-installed support attachments for aboveground fuel-oil storage tanks are to withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7.

C. Retain first subparagraph below to define the term "withstand" as it applies to this Project. Definition varies with type of building and occupancy and is critical to valid certification. Option is used for essential facilities where equipment must operate immediately after an earthquake.

1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
2. Component Importance Factor: 1.5.

D. Wind Performance: Aboveground fuel-oil storage tanks are to withstand the effects of wind determined in accordance with ASCE/SEI 7 See

2.2 ABOVEGROUND FUEL-OIL STORAGE TANKS, HORIZONTAL, STEEL

A. Source Limitations: Obtain horizontal, steel, aboveground fuel-oil storage tanks from single manufacturer.

B. Description:

1. UL 142double-wall, horizontal steel tank; with primary- and secondary-containment walls and interstitial space.

C. Construction: Fabricated with welded carbon steel; suitable for operation at atmospheric pressure and for storing fuel oil with specific gravity up to 1.1 and with maintained temperature up to 150 deg F.

D. Supports:

1. Manufacturer's standard structural steel welded to tank.
2. Manufacturer's standard type, steel cradles, for field installation.

E. Capacities and Characteristics:

1. Capacity: per plans.
2. Manholes:
    a. Number Required: 1.
    b. Minimum Diameter: 24 inches.
3. Fuel: Fuel oil

2.3 ABOVEGROUND FUEL-OIL STORAGE TANK, SHOP PAINTING

A. Apply manufacturer's standard prime coat to exterior steel surface of aboveground fuel-oil storage tank and tank supports.

B. Prepare exterior steel surface of aboveground fuel-oil storage tank and tank supports.

C. Shop Cleaning: After fabrication, blast clean in accordance with SSPC-SP 6/NACE No. 3 and in accordance with the coating manufacturer’s written instructions.

D. After cleaning, remove dust or residue from cleaned surfaces.

E. If surface develops rust before prime coat is applied, repeat surface preparation.

F. Apply manufacturer's standard prime coat to shop-cleaned, dry surface same day as surface preparation.

G. Apply manufacturer's standard two-component, epoxy finish coats.

2.4 ABOVEGROUND FUEL-OIL STORAGE TANK ACCESSORIES

A. Tank Manholes:

1. 24-inch-minimum diameter; bolted, flanged, and gasketed; centered on top of tank.

B. Threaded pipe connection fittings on top of tank, for fill, supply, return, vent, sounding, and gauging, and in accordance with the plans. Include cast-iron plugs for shipping.

C. Striker Plates: Inside tank, on bottom below fill, vent, sounding, gauge, and other tube openings.

D. Lifting Lugs: For handling and installation.

E. Ladders: as indicated on the plans

F. Supply Tube: Extension of supply piping fitting into tank, terminating 6 inches above tank bottom and cut at a 45-degree angle.

G. Sounding and Gauge Tubes: Extension of fitting into tank, terminating 6 inches above tank bottom and cut at a 45-degree angle.

2.5 FUEL-OIL-LEVEL GAUGE SYSTEM

A. Source Limitations: Obtain fuel-oil-level gauge system from single manufacturer.

B. Description: Calibrated fuel-oil-level gauge system complying with UL 180 with floats or UL 1238 with probes and remote annunciator panel.

C. Annunciator Panel: With visual and audible, high-tank-level and low-tank-level alarms; fuel indicator with registration in gallons; and overfill alarm. Include gauge volume range that covers fuel-oil storage capacity.

D. Controls: Electrical, operating on 120 V ac.

2.6 FUEL-OIL LEAK-DETECTION AND MONITORING SYSTEMS

A. Fuel-Oil Leak Detection and Monitoring, Cable and Sensor System: Comply with UL 1238.

1. Source Limitations: Obtain cable-and-sensor fuel-oil leak-detection and monitoring system from single manufacturer.
2. Calibrated fuel-oil leak-detection and monitoring system with probes and other sensors and remote alarm panel for fuel-oil storage tanks and fuel-oil piping.
3. Include fittings and devices required for testing.
4. Controls: Electrical, operating on 24 V ac.
5. Remote Annunciator Panel: With visual and audible, high-tank-level and low-tank-level alarms; fuel indicator with registration in gallons; and overfill alarm. Include gauge volume range that covers fuel-oil storage capacity.
6. Remote Annunciator Panel Controls: Electrical, operating on 120 V ac.

2.7 FUEL OIL

A. Fuel Oil: ASTM D396, Grade No. 2.

2.8 SOURCE QUALITY CONTROL

A. Pressure test and inspect fuel-oil storage tanks, after fabrication and before shipment, in accordance with ASME and the following:

1. Horizontal, Single-Wall Steel Aboveground Fuel-Oil Storage Tanks: UL 142.

B. Affix standards organization's code stamp.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for aboveground fuel-oil storage tanks to verify actual locations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF ABOVEGROUND FUEL-OIL STORAGE TANKS

A. Install tank in accordance with NFPA 30 and 31 by a tank-manufacturer-trained and -certified contractor.

B. Install tank bases and supports.

C. Connect piping and vent fittings.

D. Install ground connections.

E. Install tank leak-detection and monitoring devices.

F. Install steel aboveground fuel-oil storage tanks in accordance with STI R912.

G. Fill storage tanks with fuel oil.

3.3 INSTALLATION OF FUEL-OIL-LEVEL GAUGE SYSTEM

A. Install liquid-level gauge system. Install panel where indicated on Drawings.

3.4 INSTALLATION OF LEAK-DETECTION AND MONITORING SYSTEM

A. Install leak-detection and monitoring system. Install alarm panel where indicated on Drawings.

1. Double-Wall, Fuel-Oil Storage Tanks: Install probes or use factory-installed integral probes in interstitial space.
2. Install liquid-level gauge.

3.5 ABOVEGROUND FUEL-OIL STORAGE TANK, FIELD PAINTING

A. Prepare and touch up damaged exterior surface of aboveground fuel-oil storage tank and supports.

END OF SECTION

SECTION 23 21 13
HYDRONIC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper tube and fittings.
2. Piping joining materials.
3. Transition fittings.
4. Dielectric fittings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installers of Pressure-Sealed Joints: Installers are to be certified by pressure-seal joint manufacturer as having been trained and qualified to join piping with pressure-seal pipe couplings and fittings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation are to be capable of withstanding the following minimum working pressures and temperatures unless otherwise indicated:

1. Hot-Water Heating Piping: 50 psig at 200 deg F
2. Condensate-Drain Piping.
3. Pressure-Relief-Valve-Inlet and -Outlet Piping: Equal to the pressure of the piping system to which it is attached.

2.2 COPPER TUBE AND FITTINGS

A. Drawn-Temper Copper Tube: ASTM B88, Type L.

B. Cast-Copper, Solder-Joint Fittings: ASME B16.18 pressure fittings. Wrought-Copper, Solder-Joint Fittings: ASME B16.22 pressure fittings. Flanges in "Bronze Flanges" Paragraph below are generally available in NPS 1/2 to NPS 12 (DN 15 to DN 300).

C. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends. Do not use solder joints on pipe sizes greater than NPS 4.

D. Cast-Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends. Do not use solder joints on pipe sizes greater than NPS 4.

E. Wrought-Copper Unions: ASME B16.22. Do not use solder joints on pipe sizes greater than NPS 4.

F. Copper-Tube, Pressure-Seal-Joint Fittings - Copper or Bronze:

1. Source Limitations: Obtain copper-tube pressure-seal-joint fittings from single manufacturer.
2. Housing: Copper or bronze.
3. O-Rings and Pipe Stops: EPDM.
4. Tools: Manufacturer's special tools.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Hot-Water Heating Piping, Aboveground, NPS 2 (DN 50) and Smaller, to Be Any of the Following:

1. Type L, copper tube, wrought-copper fittings, and solderedor pressure-seal joints.

B. Condensate-Drain Piping Installed Aboveground to Be Any of the Following:

1. Type L copper tubing, wrought-copper fittings, and [soldered] or pressure-seal joints.
2. Schedule 40, PVC plastic pipe and fittings and solvent-welded joints.

C. Pressure-Relief-Valve-Inlet and -Outlet Piping for Hot-Water Piping: Same materials and joining methods as for piping specified for the service in which safety valve is installed, with metal-to-plastic transition fittings for plastic piping systems, according to piping manufacturer's written instructions.

3.2 INSTALLATION OF PIPING

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. 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.

B. Install piping at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

C. Install piping to permit valve servicing.

D. Install piping at indicated slopes.

E. Install piping free of sags and bends.

F. Install fittings for changes in direction and branch connections.

G. Install piping to allow application of insulation.

H. Select system components with pressure rating equal to or greater than system operating pressure.

I. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

J. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

K. Install piping at a uniform grade of 0.2 percent upward in direction of flow.

L. Install branch connections to mains using fittings in main pipe, with the branch connected to the bottom of the main pipe.

M. Comply with requirements in Section 230500 "Common Work Results for Mechanical Systems" for installation of expansion loops, expansion joints, anchors, and pipe alignment guides.

N. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230500 "Common Work Results for Mechanical Systems."

3.3 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. Soldered Joints: Apply ASTM B813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints in accordance with ASTM B828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B32.

D. Brazed Joints: Construct joints in accordance with AWS's "Brazing Handbook," "Pipe and Tube" chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8/A5.8M.

E. Threaded Joints: Thread pipe with tapered pipe threads in accordance with ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

G. Pressure-Seal Joints: Use manufacturer-recommended tools and procedure. Leave insertion marks on pipe after assembly.

3.4 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for Mechanical Piping and Equipment."

B. Comply with requirements in Section 230529 "Hangers and Supports for Mechanical Piping and Equipment" for hangers, supports, and anchor devices.

C. Install hangers for copper tubing with maximum horizontal spacing and minimum rod diameters, to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

D. Install hangers for plastic piping, with maximum horizontal spacing and minimum rod diameters, to comply with manufacturer's written instructions,

locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

E. Install hangers for fiberglass piping, with maximum horizontal spacing and minimum rod diameters, to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.5 TERMINAL EQUIPMENT CONNECTIONS

A. Sizes for supply and return piping connections are to be the same as or larger than equipment connections.

B. Install ports for pressure gauges and thermometers at coil inlet and outlet connections. Comply with requirements in Section 230500 "Common Work Results for Mechanical Systems."

3.6 SYSTEM STARTUP

A. Perform the following before operating the system:

1. Open manual valves fully.
2. Inspect pumps for proper rotation.
3. Set makeup pressure-reducing valves for required system pressure.
4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
5. Set temperature controls so all coils are calling for full flow.
6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
7. Verify lubrication of motors and bearings.

3.7 FIELD QUALITY CONTROL

A. Prepare hydronic piping in accordance with ASME B31.9 and as follows:

1. Leave joints, including welds, uninsulated and exposed for examination during test.
2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.

4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure is to be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
5. Install pressure-relief valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.

B. Perform the following tests on hydronic piping:

1. Use ambient-temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
3. Isolate expansion tanks and determine that hydronic system is full of water.
4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure is not to exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times the "SE" value in Appendix A in ASME B31.9.
5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
6. Prepare written report of testing.

END OF SECTION

SECTION 23 34 16
CENTRIFUGAL HVAC FANS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Forward-curved centrifugal fans.
2. Square in-line centrifugal fans.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes for fans.
2. Rated capacities, operating characteristics, and furnished specialties and accessories.
3. Certified fan performance curves with system operating conditions indicated.
4. Certified fan sound-power ratings.
5. Motor ratings and electrical characteristics, plus motor and electrical accessories.
6. Material thickness and finishes, including color charts.
7. Dampers, including housings, linkages, and operators.
8. Fan speed controllers.

B. Shop Drawings:

1. Include plans, elevations, sections, and attachment 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 diagrams for power, signal, and control wiring.
4. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints.
5. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

C. Delegated Design Submittal: For vibration isolation and seismic restraints indicated to comply with performance requirements and design criteria,

including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Design Calculations: Calculate requirements for selecting vibration isolators, seismic restraints.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For centrifugal fans to include in normal operation, emergency operation, and maintenance manuals with replacement parts listing.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

2.2 FORWARD-CURVED CENTRIFUGAL FANS

A. Description:

1. Factory-fabricated, -assembled, -tested, and -finished, direct-driven centrifugal fans, consisting of housing, wheel, fan shaft, bearings, motor, drive assembly, and support structure.
2. Deliver fans as factory-assembled units, to the extent allowable by shipping limitations.
3. Factory-installed and -wired disconnect switch.

B. Housings:

1. Housing Material: See schedule.
2. Housing Coating: See schedule.
3. Panel Bracing: Steel angle- or channel-iron member supports for mounting and supporting fan scroll, wheel, motor, and accessories.

C. Wheels:

1. Wheel Configuration: per schedule.
2. Wheel and Blade Material: See schedule.
3. Wheel and Blade Coating: See schedule.
4. Forward-Curved Wheels:

    a. Black-enameled or galvanized-steel construction with inlet flange, backplate, and shallow blades with inlet and tip curved forward in direction of airflow.

b. Mechanically secured to flange and backplate; cast-steel hub swaged to backplate and fastened to shaft with setscrews.

D. Shafts:

1. Statically and dynamically balanced and selected for continuous operation at maximum rated fan speed and motor horsepower, with adjustable alignment and belt tensioning.
2. Turned, ground, and polished hot-rolled steel with keyway. Ship with protective coating of lubricating oil.
3. Designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.

E. Motor Enclosure: per schedule.

F. Accessories: per schedule and as needed to meet the design intent indicated or reasonably implied from the construction documents.

2.3 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230500 "Common Work Results for Mechanical Systems."

B. Comply with requirements of Division 26 and the electrical construction documents.

2.4 SOURCE QUALITY CONTROL

A. AMCA Certification for Fan Sound Performance Rating: Test, rate, and label in accordance with AMCA 311.

B. AMCA Certification for Fan Aerodynamic Performance Ratings: Test, rate, and label in accordance with AMCA 211.

C. AMCA Certification for Fan Energy Index (FEI): Test, rate, and label in accordance with AMCA 211.

D. Operating Limits: Classify fans in accordance with AMCA 99, Section 14.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Install centrifugal fans level and plumb.

B. Disassemble and reassemble units, as required for moving to the final location, according to manufacturer's written instructions.

C. Lift and support units with manufacturer's designated lifting or supporting points.

D. Equipment Mounting:

1. Support duct-mounted and other hanging centrifugal fans directly from the building structure, using suitable hanging systems as specified in Section 230529 "Hangers and Supports for Mechanical Piping and Equipment."
2. Comply with requirements for vibration isolation and seismic-control devices specified in Section 230548 "Vibration and Seismic Controls for Mechanical Piping and Equipment."

E. Install units with clearances for service and maintenance.

3.2 DUCTWORK AND PIPING CONNECTIONS

3.3 ELECTRICAL CONNECTIONS

A. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

B. Install electrical devices furnished by manufacturer, but not factory mounted, according to NFPA 70 and NECA 1.

C. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.

1. Nameplate shall be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least 1/2 inch high.

3.4 CONTROL CONNECTIONS

A. Install control and electrical power wiring to field-mounted control devices, including supply and relief control dampers.

3.5 STARTUP SERVICE:

A. Perform startup service.

1. Complete installation and startup checks in accordance with manufacturer's written instructions.

2. Verify that shipping, blocking, and bracing are removed.
3. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
4. Verify that cleaning and adjusting are complete.
5. For direct-drive fans, verify proper motor rotation direction and verify fan wheel free rotation and smooth bearing operation.
6. For belt-drive fans, disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
7. Adjust belt tension.
8. Adjust damper linkages for proper damper operation.
9. Verify lubrication for bearings and other moving parts.
10. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
11. Disable automatic temperature-control operators, energize motor and confirm proper motor rotation and unit operation, adjust fan to indicated rpm, and measure and record motor voltage and amperage.
12. Shut unit down and reconnect automatic temperature-control operators.
13. Remove and replace malfunctioning units and retest as specified above.

3.6 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Lubricate bearings.

D. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.7 CLEANING

A. After completing system installation and testing, adjusting, and balancing and after completing startup service, clean fans internally to remove foreign material and construction dirt and dust.

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Fan Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Fans and components will be considered defective if they do not pass tests and inspections.

B. Prepare test and inspection reports.

3.9 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain centrifugal fans.

END OF SECTION

SECTION 23 52 23
CAST-IRON BOILERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Cast-iron boilers, trim, and accessories for generating hot water.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for boilers.
2. Include rated capacities, operating characteristics, and furnished specialties and accessories.

B. Delegated Design Submittals: For each boiler.

1. Design calculations and vibration isolation base details, signed and sealed by a qualified professional engineer.

a. Design Calculations: Calculate requirements for selecting vibration isolators and seismic.

1.3 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Data: Certificates, for boiler, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Source quality-control reports.

C. Field quality-control reports.

D. Sample Warranty: For special warranty.

E. Product Test Reports:

1. CSA B51 pressure vessel Canadian Registration Number (CRN).
2. Startup service reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For boilers, components, and accessories to include in emergency, operation, and maintenance manuals.

1.5 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace controls and heat exchangers of boilers that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Controls: One years from date of Substantial Completion.
2. Warranty Period for Heat Exchangers: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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. ASME Compliance: Fabricate and label boilers to comply with 2010 ASME Boiler and Pressure Vessel Code.

C. ASHRAE/IES 90.1 Compliance: Boilers are to have minimum efficiency in accordance with "Gas and Oil Fired Boilers - Minimum Efficiency Requirements."

D. DOE Compliance: Minimum efficiency is to comply with 10 CFR 430, Subpart B, Appendix N.

E. I=B=R Compliance: Boilers are to be tested and rated in accordance with AHRI's "Rating Procedure for Heating Boilers" and "Testing Standard for Commercial Boilers," with I=B=R emblem on a nameplate affixed to boiler.

F. UL Compliance: Test boilers for compliance with UL 726 and UL 795 Boilers are to be listed and labeled by a testing agency acceptable to authorities having jurisdiction.

G. CSA Compliance: Test boilers for compliance with CSA B51.

H. Mounting Frame: Steel rails used to mount assembled boiler package on concrete base.

1. Seismic Fabrication Requirements: Fabricate mounting base and attachment to boiler, accessories, and components with reinforcement strong enough to withstand seismic forces defined in Section 230548 "Vibration and Seismic Controls for Mechanical Piping and Equipment" when mounting base is anchored to building structure.

2.2 CAST-IRON BOILERS

A. Description: Factory fabricated and assembled.

1. Cast-iron sections are to be sealed pressure tight and held together with tie rodsincluding insulated jacket and flue-gas vent connection.

B. Boiler design and performance: per scheduled equipment OIL BURNER

C. Burner: Welded construction with multivane, stainless steel, flame-retention diffuser for fuel oil.

D. Blower: Forward-curved centrifugal fan integral to burner, directly driven by motor, with adjustable, dual-blade damper assembly and locking quadrant to set air-fuel ratio.

1. Motors: Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230500 "Common Work Results for Mechanical Systems."

a. Motor Sizes: Minimum size as indicated; if not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

E. Oil Supply: Control devices and control sequence are to comply with requirements in ASME CSD-1 and the scheduled equipment.

1. Oil Piping Specialties: per construction documents and as needed to meet local code requirements.

2.3 TRIM FOR HOT-WATER BOILERS

A. Include devices sized to comply with ASME B31.9.

B. Aquastat Controllers: Operatingand high limit.

C. Safety Relief Valve: ASME rated.

D. Pressure and Temperature Gage: Minimum 3-1/2-inch-diameter, combination water-pressure and -temperature gage. Gages are to have operating-pressure and -temperature ranges, so normal operating range is about 50 percent of full range.

E. Boiler Air Vent: Automatic.

F. Drain Valve: Minimum NPS 3/4 hose-end gate valve.

2.4 CONTROLS

A. Sequence of Operation: Electric, factory-fabricated and field-installed panel to control burner firing rate and primary and backup pump to maintain space temperature in response to call for heating.

1. Include automatic, alternating-firing sequence for multiple boilers to provide equal runtime for boilers.

B. Safety Controls: To maintain safe operating conditions, burner safety controls limit burner operation.

1. High Cutoff Automatic reset stops burner if operating conditions rise above maximum boiler design temperature.
2. Low-Water Cutoff Switch: probe prevents burner operation on low water. Cutoff switch is to be automatic-reset type.
3. Blocked Vent Safety Switch: Manual-reset switch factory mounted on draft diverter.
4. Rollout Safety Switch: Factory mounted on boiler combustion chamber.
5. Audible Alarm: Factory mounted on control panel with silence switch; alarm sounds for above conditions.

2.5 ELECTRICAL POWER

A. Controllers, Electrical Devices, and Wiring: Electrical devices and connections are specified in electrical Sections.

B. Single-Point Field Power Connection: Factory-installed and -wired switches, motor controllers, transformers, and other electrical devices necessary provide a single-point field power connection to boiler.

1. House in NEMA 250, Type 1 enclosure.
2. Wiring is to be numbered and color coded to match wiring diagram.
3. Install factory wiring outside of an enclosure in a metal raceway.
4. Field power interface is to be to fused disconnect switch.
5. Provide branch power circuit to each motor and to controls with disconnect switch.
6. Provide each motor with overcurrent protection.

2.6 CAPACITIES AND CHARACTERISTICS

A. Hot-Water Heating: per schedule.

2.7 SOURCE QUALITY CONTROL

A. Test and inspect factory-assembled boilers, before shipping, in accordance with 2010 ASME Boiler and Pressure Vessel Code

B. Burner and Hydrostatic Test: Factory adjust burner to eliminate excess oxygen, carbon dioxide, oxides of nitrogen emissions, and carbon monoxide in flue gas and to achieve combustion efficiency; perform hydrostatic test.

C. Allow Owner access to source quality-control testing of boilers. Notify Owner 14 days in advance of testing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for equipment bases, anchor-bolt sizes and locations, and piping and electrical connections to verify actual locations, sizes, and other conditions affecting performance of the Work.

1. Final boiler locations indicated on Drawings are approximate. Determine exact locations before roughing-in for piping and electrical connections.

B. Examine mechanical spaces for suitable conditions where boilers will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF CAST-IRON BOILERS

A. Equipment Mounting:

1. Comply with requirements for vibration isolation and seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for Mechanical Piping and Equipment."

B. Install oil-fired boilers in accordance with NFPA 31.

C. Assemble boiler sections in sequence and seal between each section.

D. Assemble and install boiler trim.

E. Install electrical devices furnished with boiler but not specified to be factory mounted.

F. Install control wiring to field-mounted electrical devices.

3.3 CONNECTIONS

A. Piping installation requirements are specified in Section 232113 "Hydronic Piping" Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to boiler to allow service and maintenance.

C. Connect oil piping full size to burner inlet with shutoff valve and union.

D. Connect hot-water piping to supply- and return-boiler tappings with shutoff valve and union or flange at each connection.

E. Install piping from safety relief valves to nearest floor drain.

F. Install piping from safety valves to drip-pan elbow and to nearest floor drain.

G. Install piping from equipment drain connection to nearest floor drain. Piping is to be at least full size of connection. Provide an isolation valve if required.

H. Connect breeching full size to boiler outlet. Comply with requirements in Section 235116 "Fabricated Breechings and Accessories" for venting materials.

I. Install flue-gas recirculation duct from vent to burner. Comply with requirements in Section 235123 "Gas Vents" for recirculation duct materials.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections, oil burner, all safeties and flues.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Perform installation and startup checks in accordance with manufacturer's written instructions.
2. Leak Test: Hydrostatic test. Repair leaks and retest until no leaks exist.
3. Operational Test: Start units to confirm proper motor rotation and unit operation. Adjust air-fuel ratio and combustion.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

    a. Burner Test: Adjust burner to eliminate excess oxygen, carbon dioxide, oxides of nitrogen emissions, and carbon monoxide in flue gas and to achieve combustion efficiency.
    b. Check and adjust initial operating set points and high- and low-limit safety set points of fuel supply, water level, and water temperature.

C. Remove and replace malfunctioning units and retest as specified above.

D. Performance Tests:

1. Engage a factory-authorized service representative to inspect component assemblies and equipment installations, including connections, and to conduct performance testing.
2. Boilers are to comply with performance requirements indicated,. Adjust, modify, or replace equipment to comply.
3. Perform field performance tests to determine capacity and efficiency of boilers.
4. Provide analysis equipment required to determine performance.
5. Provide temporary equipment and system modifications necessary to dissipate the heat produced during tests if building systems are inadequate.
6. Notify Owner in advance of test dates.
7. Document test results in a report and submit to Owner.

E. Boiler will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

3.5 DEMONSTRATION

A. Owner's maintenance personnel to adjust, operate, and maintain boilers. See Section 017900 "Demonstration and Training."

END OF SECTION

SECTION 26 05 00
COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Electrical equipment coordination and installation.
2. Sleeves for raceways and cables.
3. Sleeve seals.
4. Grout.
5. Common electrical installation requirements.

B. The work under this division includes furnishing all materials, equipment, labor, supervision, tools, and items necessary for the construction, installation, connection, testing and operation of all electrical work for this project as shown on the electrical drawings specified herein.

C. Related Work Described Elsewhere: Where other divisions require electrical materials or installations, comply with all applicable requirements herein. Provide all electrical materials and installation work required to connect, test and operate equipment required by other divisions. Electrical installations required by other divisions but not shown on the electrical drawings shall be provided.

D. Warranty: The Contractor shall guarantee all work installed under this specification and make good, repair, or replace at his own expense any defective work, materials, or parts. Incandescent lamps are not warranted but all shall be operating at time of final acceptance.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.
B. NBR: Acrylonitrile-butadiene rubber.

C. Provide: To furnish and install.
D. Wiring: Raceway, conductors, and connections.
E. Exposed: Visible from occupied areas.
F. Install: To set in position and make fully operational.
G. Furnish: Purchase and deliver to the job site.
H. Required: As required by code, authority having jurisdiction or contract documents for the system and/or installation to be fully operational.

1.4 REGULATIONS

A. Codes and Ordinances: Comply with all applicable codes, ordinances and regulations including the National Electrical Code, National Electrical Safety Code, NFPA and all other national, state, and local codes and ordinances. Notify the Engineer of any noncompliance in contract documents to applicable codes and regulations prior to installation of the work. Changes in the work after initial installation due to requirements of code enforcing agencies shall be at no additional cost to the Owner.
B. Permits: Provide and pay for all permits and fees required for this project. In addition to paying for all permits and fees, the Contractor shall be responsible for contacting the various Approving Authorities, arranging for review of shop drawings where appropriate, scheduling inspections in a timely manner, and making necessary corrections as required by the Approving Authorities.
C. Approving Authority: It is the Contractor's responsibility to ascertain and contact the appropriate "Approving Authorities" for this project. Approving Authorities will include, but not be limited to the electrical inspector and the Fire Marshal having jurisdiction.
D. Certificate of Inspection: Obtain a Certificate of Electrical Inspection indicating final acceptance from the local inspecting authority.
E. Safety Measures To Be Taken: The Engineer has not been retained or compensated to provide design and construction review services relating to the Contractor's safety precautions or to means, methods, techniques, sequences or procedures required for the Contractor to perform his work. The Contractor will be solely and completely responsible for conditions of the job site, including safety of all persons and property during performance of the work. This requirement will apply continuously and not be limited to normal working hours. The duty of the Engineer to conduct construction observations of the contractor's performance is not intended to include review

of the adequacy of the contractor's safety measures in, on or near the construction site.

1.5 DRAWINGS AND SPECIFICATIONS

A. Intent: The electrical drawings and specifications are intended to include all labor and materials necessary to provide a complete and operating facility. Any materials shown and called for on the drawings but not mentioned in the specifications, or vice versa, which are necessary for the proper completion of the installation or operation of the equipment, shall be furnished the same as if specifically called for in both. By submitting a bid, the Contractor is acknowledging that he has made a thorough examination of the contract documents, existing site conditions, and has determined that these documents and conditions do sufficiently describe the scope of construction work required under this contract. Any questions regarding interpretation of the contract documents shall be made in writing in a timely manner prior to the bid date to allow reasonable time for resolution of the questions.
B. Diagrammatic Drawings: The electrical drawings are diagrammatic and do not show exact or complete raceway and wiring configurations, routing, rating or the necessary number and types of raceway fittings or pull boxes. Provide all labor and materials required to execute the work.

1.6 SUBMITTALS AND SHOP DRAWINGS

A. It is the Contractor's responsibility to thoroughly review vendor-assembled shop drawings, catalog cuts, etc. to ensure that these documents are complete and comply with the specifications.
B. All submittals and shop drawings must be stamped by the Electrical Contractor and the General Contractor confirming they have been reviewed and comply with the contract documents. Submittals which are not stamped will be returned unreviewed.
C. Submittal Format:

    1. General: The submittals must include all specified material. Multiple submittals will not be accepted.
    2. Electronic submittals can be submitted. However, bound hard copies of the distribution equipment (switchboards, transformers, distribution panels and panelboards) and lighting must be provided.
    3. Shop Drawings: Only one hard copy shall be provided for review. One electronic copy (PDF) will be returned.

D. Review: The review of a manufacturer's name or product does not relieve the Contractor of the responsibility for providing materials and equipment which

comply in all details with the requirements of the contract documents. Contractor shall be solely responsible for submitting materials at such a time to allow a minimum of two weeks for Engineer's review.

1.7 OPERATIONS AND MAINTENANCE MANUALS

A. Prepare operations and maintenance manuals for all electrical equipment installed on this project.
B. Provide table of contents at front of manual indicating general content of each section. Provide index for each section of the manual with complete equipment catalog item or identification.
C. The information and diagrams included must be on the specific equipment installed for this project. General "product line" information is not acceptable. The equipment model and catalog numbers with appropriate prefixes and suffixes must be clearly indicated on the data sheets. Manuals shall contain shop drawings, schematic and wiring diagrams (showing all external connections), parts lists, operating and maintenance information. Any modifications to equipment in the field shall be updated on the drawings, diagrams, etc. to reflect the "as-built" conditions.
D. Bind with three-screw post-type binder with heavy-duty hardboard cover and cloth backing. Imprint the edge of volume with name of the project, year of completion and the words "Electrical Equipment." Front of manual shall be imprinted with the words "Electrical Equipment," the name of the project, the name of the Owner, year completed, and name of the Architect, Engineer and Contractor. If the thickness of the manual exceeds approximately two inches, provide separate volumes, each being a maximum two inches thick. Each volume shall be imprinted as described above and include the volume number.
E. Submit 2 CD-ROM copies of the operations and maintenance manual. Disk data is to be in Adobe Acrobat v11.0 or later. Arrange information and materials in the same order and categories as is typical of printed hard copy O&M manuals as described in this section. Disk PDF file shall include electronic “bookmarks” for each category, specification section and subsection.
F. One preliminary copy shall be submitted to the Engineer for review 30 days prior to completion of the project. Preliminary copy shall include proposed wording for cover and back edge of the manual. Submit final bound copies for distribution as required in Division 01.

1.8 RECORD DRAWINGS

A. A record shall be made during the progress of the project indicating the work as actually installed. Corrections and changes shall be kept up to date at all times on a separate set of record drawings kept at the job site for review. Mark-ups may be schematic as related to interior raceway systems; however, all raceways shall be shown in proper relationship with junction boxes, panelboards, devices and equipment. Raceways installed below grade shall be shown with both horizontal and vertical dimensions with an accuracy of ± six inches.
B. Project Closeout: The Contractor shall provide as-built drawings at completion of the project indicating work as revised, detailed and actually installed.

1.9 COORDINATION

A. Coordinate arrangement, mounting, and support of electrical equipment:

   1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
   2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
   3. To allow right of way for piping and conduit installed at required slope.
   4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
C. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed.
D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section " Firestopping."
E. UTILITIES SERVICES

   1. It shall be the Contractor's responsibility to contact all utility companies, including but not limited to the power company, and telephone company and verify the extent of work to be performed by the utility companies. All other labor and necessary materials provided by the utility companies shall be provided by the Contractor.
   2. Coordination and scheduling new services with the various utility companies is the sole responsibility of the Contractor.
   3. In general, the Contractor shall be responsible for providing the following:

a. Trenching, backfill, and compaction.
b. Raceways.
c. Manholes and vaults (including grounding).
d. Concrete encasement of raceways (where called out on the drawings or specified).
e. Obtaining all necessary permits.

4. Service Charges: All utility service charges will be paid by the Owner.
5. Applications for Services: It shall be the contractor's responsibility to complete and submit all required applications for service with the various utility companies.

F. Work of Other Trades: The electrical drawings do not show complete details of the building construction. Refer to the Architectural, Structural, Civil, Landscape, Mechanical and Kitchen Drawings for details which may affect the execution of this work. Specific locations of construction features shall be obtained from the reference drawings, field measurements, or the trade providing the material or equipment. No extra payments will be allowed for failure to obtain this information.

G. The Contractor will not be paid for work requiring reinstallation due to lack of coordination prior to installation such as removing and replacing, relocating, cutting, patching, or finishing. Special attention is called to the following items and all conflicts shall be coordinated prior to installation:

1. Light switches will be located on the "strike" side of the door.
2. All electrical outlets, lighting fixtures and other electrical outlets and equipment are installed to avoid conflict with grilles, pipes, sprinkler heads, ducts and other mechanical equipment.
3. Electrical outlets, lighting fixtures and equipment are to be installed in proper relation to cabinets, counters, doors and other architectural appurtenances.
4. Electrical characteristics (HP, kVA, voltage, phase, fusing, overload protection) of actual equipment furnished under other divisions being different from that shown on the electrical drawings.

PART 2 - PRODUCTS

2.1 STANDARD OF QUALITY

A. General: Whenever any material or equipment is specified by patent or proprietary name or by the name of the manufacturer, such specification shall establish the minimum standard of quality in that particular field of manufacture. The engineer shall be the sole and final judge as to quality and acceptability of substitutions, no exceptions.

2.2 PRODUCT LISTING AND LABELING

A. All electrical equipment shall be Underwriters Laboratories listed and labeled. Equipment in compliance with UL standards but not bearing their label is not acceptable. If the manufacturer cannot arrange for labeling of an assembled unit at the factory, the necessary inspection and acceptance by the testing facility shall be performed in the field at no additional cost to the Owner and be acceptable to the Authority Having Jurisdiction.

2.3 ELECTRICAL DISTRIBUTION EQUIPMENT

A. Scope: Provide the equipment for the various primary and secondary voltage distribution systems including switchgear, service transformer, service switchboards, distribution switchboards, panelboard equipment, motor control centers, dry-type transformers, and all miscellaneous equipment.
B. Type: The distribution equipment shall provide a quality system with the highest degree of safety, protection, and integrity.
C. Space for Future Circuit Breakers and Fused Switches: Provide as indicated on drawings; shall be completely equipped for the future addition of a circuit breaker or fused switch, including all connections. Each switchboard or panelboard section shall be fully bussed with spaces available the entire height of the equipment.
D. Finish: Finish of all distribution equipment and other associated equipment shall match and unless specified otherwise shall be manufacturer's standard light gray.
E. Phasing:

1. Phase arrangement for all bussing and terminations in switchboards, panelboards, motor starter centers, transformers, etc. shall be as follows when viewed from the front:

PHASE A FRONT LEFT TOP
PHASE B CENTER CENTER CENTER
PHASE C REAR RIGHT BOTTOM

2. Lugs for switchboards, panelboards, transformers, and other distribution equipment connections shall be hydraulically set compression lugs.

F. Manufacturer: The number of manufacturers shall be kept to a minimum to maintain close control and coordinate the various components of the distribution systems. All electrical distribution equipment shall be provided by the same manufacturer. Dimensions are critical. Each manufacturer shall verify that the equipment proposed will fit within the spaces provided with adequate working clearances.

2.4 SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral water stop, unless otherwise indicated.
C. Sleeves for Rectangular Openings: Galvanized sheet steel.

    1. Minimum Metal Thickness:

        a. For sleeve cross-section rectangle perimeter less than 50 inches and no side more than 16 inches, thickness shall be 0.052 inch.
        b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches and 1 or more sides equal to, or more than, 16 inches, thickness shall be 0.138 inch.

2.5 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

    1. Manufacturers: Subject to compliance with requirements, 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. Metraflex Co.
        d. Pipeline Seal and Insulator, Inc.

    2. Sealing Elements: EPDM or NBR interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
    3. Pressure Plates: Plastic or Carbon steel. Include two for each sealing element.

4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.6 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, non-staining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Comply with NECA 1.
B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
E. Right of Way: Give to piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
E. Cut sleeves to length for mounting flush with both surfaces of walls.
F. Extend sleeves installed in floors 2 inches above finished floor level.
G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable, unless indicated otherwise.
H. Seal space outside of sleeves with grout for penetrations of concrete and masonry

    1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants.".
J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section " Firestopping."
K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

3.3 SLEEVE-SEAL INSTALLATION

A. Install to seal exterior wall penetrations.
B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space

between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Firestopping."

3.5 CUTTING AND PATCHING

A. Provide all required cutting, demolition and patching required for the installation of the electrical work. Penetrations through structural walls, ceiling or floor slabs shall be core drilled. In no case shall structural members be penetrated without prior approval of the structural engineer.

3.6 PAINTING

A. Touch up electrical equipment with factory-finished surfaces as required using factory-furnished paint. Do not paint screw heads, hinges, nameplates, hardware, etc. All surface-mounted raceways in finished areas shall be painted to match adjacent surfaces.

3.7 CLEANING

A. Promptly remove waste material and rubbish resulting from electrical work.
B. Prior to energizing equipment, remove all dirt and debris. Vacuum and wipe-down all surfaces.
C. Clean all equipment and fixtures at completion of the project.

3.8 CONSTRUCTION OBSERVATION AND FINAL ACCEPTANCE

A. Site Review: On-site meetings or reviews of construction by the Engineer shall not be construed as acceptance by these parties as related to quantities, rough-in locations and compliance with code enforcing authorities.
B. Testing: The Contractor shall test all wiring and all electrical equipment to verify absence of grounds and short circuits and verify proper operation, rotation, and phase relationship. Contractor will be responsible for scheduling of tests and demonstrations at times mutually acceptable to the Owner. All equipment shall be demonstrated to operate in accordance with the

requirements of this specification and the manufacturer's recommendations. Operate every device manually and automatically in accordance with its purpose. Tests shall be performed in the presence of the Owner or his designated representative. All instruments and personnel required to conduct the test shall be provided by the Contractor. Any test not witnessed by the Owner shall be waived by written document. All such documents must become the property of the Owner upon completion of construction.

3.9 INSTRUCTION FOR OWNER'S PERSONNEL

A. Scope: Following initial operation of all electrical equipment and prior to acceptance of the electrical work, conduct demonstrations of equipment operation and instruction periods for the Owner's representatives.
B. Instruction Periods: Shall include preliminary discussion and presentation of information from maintenance manuals with appropriate references to drawings, followed by tours of equipment spaces explaining maintenance requirements, access methods, servicing and maintenance procedures, settings and available system and equipment adjustments.
C. Contractor's representatives, in general, who conduct these instructions and demonstrations shall be qualified foremen or superintendents acquainted with this project and from the trade involved. The representative shall be the manufacturer's representative with operating experience and substantial design experience on this project for major equipment. Their qualifications shall be submitted to the Architect and Engineer before conducting the instruction period.
D. Minimum Duration of Instruction Periods:

    1. Electrical Distribution System: Four hours.
    2. Low-Voltage Systems: Four hours each unless noted otherwise.
    3. Refer to other sections of the specification for additional testing requirements.

E. Scheduling of Instruction Periods: Provide notice of contractor's readiness to conduct such instruction and demonstration periods to the Owner at least two weeks prior to each instruction period and reach agreement on the date of each instruction period.
F. Prepare a written statement of acceptance for the Owner's signature. The statement shall be substantially as follows:

"I (the Contractor), the associated factory representatives and the subcontractor, have thoroughly tested each of the following systems and have proved their normal operation to the Owner's representative and have instructed him in the operation and maintenance thereof."

Owner's System	Demonstrator	Representative	Date
Electrical Distribution & Lighting			
Communications Systems (List each system specified)			
Safety and Security Systems (List each system specified)			

_____
Owner's Representative Date

_____
Electrical Contractor Date

G. Send copies of this acceptance to the Architect and the Engineer and place one copy in each maintenance manual.

END OF SECTION

SECTION 26 05 19
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper building wire.
2. Metal-clad cable, Type MC.
3. Connectors and splices.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260011 "Facility Performance Requirements for Electrical" for seismic-load, wind-load, acoustical, and other field conditions applicable to Work specified in this Section.
3. Section 271513 "Communications Copper Horizontal Cabling" for twisted pair cabling used for data circuits.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Copper building wire.
2. Metal-clad cable, Type MC.
3. Connectors and splices.

B. Product Schedule: Indicate type, use, location, and termination locations.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
B. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

C. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.
D. Conductor Insulation:

1. Type THHN and Type THWN-2. Comply with UL 83.
2. Type THW and Type THW-2. Comply with NEMA WC-70/ICEA S-95-658 and UL 83.
3. Type XHHW-2. Comply with UL 44.

2.2 METAL-CLAD CABLE, TYPE MC

A. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.
B. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. Comply with UL 1569.
3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

C. Circuits:

1. Single circuit and multicircuit with color-coded conductors.
2. Power-Limited Fire-Alarm Circuits: Comply with UL 1424.

D. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.
E. Ground Conductor: Bare.

F. Conductor Insulation:

1. Type TFN/THHN/THWN-2. Comply with UL 83.
2. Type XHHW-2. Comply with UL 44.

G. Armor: Aluminum, interlocked.
H. Jacket: PVC applied over armor.

2.3 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
B. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.
C. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.

1. Material: Copper.
2. Type: Two hole with standard barrels.
3. Termination: Compression.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders:

1. Stranded Copper

B. Branch Circuits:

1. Copper:

a. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.

C. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type XHHW-2, single conductors in raceway.
B. Exposed Feeders: Type XHHW-2, single conductors in raceway.
C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN/THWN-2, single conductors in raceway.
D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway.
E. Feeders Installed below Raised Flooring: Type THHN/THWN-2, single conductors in raceway.
F. Exposed Branch Circuits, Including in Crawlspaces: Type THHN/THWN-2, single conductors in raceway.
G. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway, Metal-clad cable, Type MC.
H. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.
I. Branch Circuits Installed below Raised Flooring: Type THHN/THWN-2, single conductors in raceway, Metal-clad cable, Type MC.

3.3 INSTALLATION, GENERAL

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
B. Complete raceway installation between conductor and cable termination points in accordance with Section 260533.13 "Conduits for Electrical Systems" prior to pulling conductors and cables.
C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.

F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
B. Make splices, terminations, and taps that are compatible with conductor material[and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."
B. Identify each spare conductor at each end with identity number and location of other end of conductor and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

3.8 FIELD QUALITY CONTROL

A. Tests and Inspections:

    1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.

2. Perform each of the following visual and electrical tests:

    a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
    b. Test bolted connections for high resistance using one of the following:

        1) A low-resistance ohmmeter.
        2) Calibrated torque wrench.
        3) Thermographic survey.

    c. Inspect compression-applied connectors for correct cable match and indentation.
    d. Inspect for correct identification.
    e. Inspect cable jacket and condition.
    f. Insulation-resistance test on each conductor for ground and adjacent conductors. Apply a potential of 500-V(dc) for 300-V rated cable and 1000-V(dc) for 600-V rated cable for a one-minute duration.
    g. Continuity test on each conductor and cable.
    h. Uniform resistance of parallel conductors.

B. Cables will be considered defective if they do not pass tests and inspections.
C. Prepare test and inspection reports to record the following:

    1. Procedures used.
    2. Results that comply with requirements.
    3. Results that do not comply with requirements, and corrective action taken to achieve compliance with requirements.

END OF SECTION

SECTION 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Grounding and bonding conductors.
2. Grounding and bonding clamps.
3. Grounding and bonding bushings.
4. Grounding and bonding hubs.
5. Grounding and bonding connectors.
6. Intersystem bonding bridge grounding connector.
7. Grounding and bonding busbars.
8. Grounding (earthing) electrodes.
9. Grounding electrode enclosures.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" specifies additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260011 "Facility Performance Requirements for Electrical" specifies seismic-load, wind-load, acoustical, and other field conditions applicable to Work specified in this Section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 GROUNDING AND BONDING CONDUCTORS

A. Equipment Grounding Conductor:

1. General Characteristics: 600 V, copper wire or cable, green color, in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Isolated Equipment Grounding Conductor:

1. General Characteristics: 600 V, copper wire or cable, green color with one or more yellow stripes, in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. ASTM - Bare Copper Grounding and Bonding Conductor:

1. Referenced Standards: Complying with one or more of the following:

a. Soft or Annealed Copper Wire: ASTM B3.
b. Concentric-Lay Stranded Copper Conductor: ASTM B8.

2.2 GROUNDING AND BONDING CLAMPS

A. Description: Clamps suitable for attachment of grounding and bonding conductors to grounding electrodes, pipes, tubing, and rebar. Grounding and bonding clamps specified in this article are also suitable for use with communications applications.
B. Source Limitations: Obtain products from single manufacturer.
C. Performance Criteria:

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

2. Listing Criteria:

a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.

2.3 GROUNDING AND BONDING BUSHINGS

A. Description: Bonding bushings connect conduit fittings, tubing fittings, threaded metal conduit, and unthreaded metal conduit to metal boxes and equipment enclosures and have one or more bonding screws intended to provide electrical continuity between bushing and enclosure. Grounding bushings have provision for connection of bonding or grounding conductor and may or may not also have bonding screws.
B. Source Limitations: Obtain products from single manufacturer.

C. Performance Criteria:

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

2. Listing Criteria:

a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

D. UL KDER - Bonding Bushing:

1. General Characteristics: Threaded bushing with insulated throat.

E. UL KDER - Grounding Bushing:

1. General Characteristics: Threaded bushing with insulated throat and mechanical-type wire terminal.

2.4 GROUNDING AND BONDING HUBS

A. Description: Hubs with certified grounding or bonding locknut.
B. Source Limitations: Obtain products from single manufacturer.
C. Performance Criteria:

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

2. Listing Criteria:

a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

D. UL KDER - Grounding and Bonding Hub:

1. General Characteristics: Insulated, gasketed, watertight hub with mechanical-type wire terminal.

2.5 GROUNDING AND BONDING CONNECTORS

A. Source Limitations: Obtain products from single manufacturer.

B. Performance Criteria:

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

2. Listing Criteria:

a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.

C. UL KDER - Pressure-Type Grounding and Bonding Busbar Cable Connector:

1. General Characteristics: Copper or copper alloy, for compression bonding of one or more conductor directly to copper busbar. Listed for direct burial.

D. UL KDER - Lay-In Lug Mechanical-Type Grounding and Bonding Busbar Terminal:

1. General Characteristics: Mechanical-type, copper rated for direct burial terminal with set screw.

E. UL KDER - Crimped Lug Pressure-Type Grounding and Bonding Busbar Terminal:

1. General Characteristics: Cast silicon bronze, solderless compression-type wire terminals; with long barrel and two holes spaced on 5/8 or 1 inch centers for two-bolt connection to busbar.

F. UL KDER - Split-Bolt Service-Post Pressure-Type Grounding and Bonding Busbar Terminal:

1. General Characteristics: Bolts that surround cable and bond to cable under compression when nut is tightened after assembly is screwed into busbar opening.

G. UL KDER - Crimped Pressure-Type Grounding and Bonding Cable Connector:

1. General Characteristics: Crimp-and-compress connectors that bond to conductor when connector is compressed around conductor.

a. Copper, C and H shaped.

H. UL KDER - Split-Bolt Pressure-Type Grounding and Bonding Cable Connector:

1. General Characteristics: Bolts that surround cable and bond to cable under compression when nut is tightened.

    a. Copper.

I. UL KDER - Signal Reference Grid Grounding and Bonding Connector:

1. General Characteristics: Combination of compression wire connectors, access floor grounding clamps, bronze U-bolt grounding clamps, and copper split-bolt connectors, designed for the purpose.

2.6 INTERSYSTEM BONDING BRIDGE GROUNDING CONNECTORS

A. Description: Devices that provide means for connecting communications systems grounding and bonding conductors at service equipment or at disconnecting means for buildings or structures.
B. Performance Criteria:

1. Regulatory Requirements:

    a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

2. Listing Criteria:

    a. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.

C. UL KDSH - One-Piece Intersystem Bonding Bridge Grounding Connector:

1. General Characteristics: Zinc-alloy one-piece construction; six terminating points; gangable.

D. UL KDSH - Two-Piece Intersystem Bonding Bridge Grounding Connector:

1. General Characteristics: Copper body and polycarbonate cover; four terminating points.

2.7 GROUNDING AND BONDING BUSBARS

A. Description: Miscellaneous grounding and bonding devices that serve as common connection for multiple grounding and bonding conductors.
B. Source Limitations: Obtain products from single manufacturer.

C. Performance Criteria:

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

2. Listing Criteria:

a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

D. UL KDER - Equipment Room Grounding and Bonding Busbar:

1. General Characteristics:

a. Bus: Rectangular bar of annealed copper.
b. Mounting Stand-Off Insulators: Lexan or PVC.

1) Comply with UL 891 for use in 600 V switchboards, impulse tested at 5000 V.

2. Options:

a. Dimensions: ¼ x 4 x 12 inch cross section; length as indicated on Drawings.
b. Predrilled Hole Pattern: Complying with BICSI N3 and TIA-607 9/32 inch holes spaced 1-1/8 inch apart, suitable for installing specified grounding and bonding connectors.
c. Mounting Hardware: Stand-off brackets that provide 2 inch clearance to access rear of bus. Brackets and bolts must be stainless steel.

E. UL KDER - Rack and Cabinet Bonding:

1. General Characteristics:

a. Bus: Rectangular bar of hard-drawn solid copper.
b. Horizontal Mounting Dimensions: Designed for mounting in 23 inch wide equipment racks or cabinets.
c. Vertical Mounting Dimensions: Designed for mounting in 72 inch high equipment racks or cabinets.
d. Predrilled Hole Pattern: Accepts connectors for grounding and bonding conductor sizes 14 AWG to 2/0 AWG.
e. Mounting Hardware: Stainless steel or copper-plated, for attachment to rack.

2.8 GROUNDING (EARTHING) ELECTRODES

A. Source Limitations: Obtain products from single manufacturer.
B. Performance Criteria:

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

2. Listing Criteria:

a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

C. UL KDER - Rod Electrode:

1. General Characteristics: Copper-clad steel; 3/4 inch by 10 ft.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine facility's 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 electrical system.
B. Inspect test results of grounding system measured at point of electrical service equipment connection.
C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
D. Proceed with connection of electrical service equipment only after unsatisfactory conditions have been corrected.

3.2 SELECTION OF GROUNDING AND BONDING PRODUCTS

A. Grounding and Bonding Conductors:

1. Provide solid conductor for 8 AWG and smaller, and stranded conductors for 6 AWG and larger unless otherwise indicated.
2. Bonding Cable: 28 kcmil, 14 strands of 17 AWG conductor, 1/4 inch in diameter.

3. Bonding Conductor: 4 AWG or 6 AWG, stranded conductor.
4. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inch wide and 1/16 inch thick.
5. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inch wide and 1/16 inch thick.
6. Underground Grounding Conductors: Install bare copper conductor, 2/0 AWG minimum.

B. Grounding and Bonding Connectors:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

C. Grounding and Bonding Busbars: Provide in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated on Drawings.

3.3 SELECTION OF GROUNDING AND BONDING PRODUCTS FOR COMMUNICATIONS

A. Comply with Section 270528 "Pathways for Communications Systems" and Section 271100 "Communications Equipment Room Fittings."

3.4 INSTALLATION OF GROUNDING AND BONDING

A. Comply with manufacturer's published instructions.
B. Reference Standards:

1. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor and install in conduit.
2. Consult Architect for resolution of conflicting requirements.

C. Special Techniques:

1. Grounding and Bonding Conductors:

a. 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.
b. Underground Grounding Conductors:

    1) Bury at least 30 inches below grade.
    2) Duct-Bank Grounding Conductor: Bury 12 inch above duct bank when indicated as part of duct-bank installation.

2. Grounding and Bonding Connectors: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.

    a. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
    b. Make connections with clean, bare metal at points of contact.
    c. Make aluminum-to-steel connections with stainless steel separators and mechanical clamps.
    d. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
    e. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
    f. 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 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 disconnect-type connection is required, use bolted clamp.

    g. 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 bolted clamp connector or bolt lug-type connector to pipe flange by using one of lug bolts of flange. Where 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 bolted connector.
3) Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

h. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.
i. Grounding for Steel Building Structure: Install driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 ft apart.

3. and Bonding Busbars:

a. Install busbar horizontally, on insulated spacers 2 inch minimum from wall, 6 inch above finished floor unless otherwise indicated.
b. Where busbars are indicated on both sides of doorways, route bonding conductor up to top of door frame, across top of doorway, and down; connect to continuation of horizontal busbar.

4. Electrodes:

a. Ground Rods: Drive rods until tops are 2 inch below finished floor or final grade unless otherwise indicated.

1) Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
2) Use exothermic welds for below-grade connections.

b. For grounding electrode system, install at least two rods spaced at least one-rod length from each other and located at least same distance from other grounding electrodes, and connect to service grounding electrode conductor.

5. Grounding at Service:

a. Equipment grounding conductors and grounding electrode conductors must be connected to ground busbar. Install main bonding jumper between neutral and ground buses.

6. Grounding Separately Derived Systems:

a. Permanent Generators: Install grounding electrode(s) at location of permanent generators having switched neutral connections. Electrode

must be connected to equipment grounding conductor and to frame of generator.

7. Grounding Underground Distribution System Components:

   a. Comply with IEEE C2 grounding requirements.

8. Equipment Grounding and Bonding:

   a. Install insulated equipment grounding conductors with feeders and branch circuits.
   b. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

      1) Feeders and branch circuits.
      2) Lighting circuits.
      3) Receptacle circuits.
      4) Single-phase motor and appliance branch circuits.
      5) Three-phase motor and appliance branch circuits.
      6) Flexible raceway runs.
      7) Armored and metal-clad cable runs.
      8) Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
      9) X-Ray Equipment Circuits: Install insulated equipment grounding conductor in circuits supplying x-ray equipment.

   c. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
   d. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
   e. Isolated Grounding Receptacle Circuits: Install insulated equipment grounding conductor connected to receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of applicable derived system or service unless otherwise indicated.
   f. Isolated Equipment Enclosure Circuits: For designated equipment supplied by branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure and install separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at

equipment grounding conductor terminal of applicable derived system or service unless otherwise indicated.

g. Poles Supporting Outdoor Lighting Fixtures: Bond insulated equipment grounding conductor to equipment grounding terminal inside pole base.
h. Metallic Fences: Comply with requirements of IEEE C2.

    1) Grounding Conductor: Bare copper, not less than 8 AWG.
    2) Gates: Must be bonded to grounding conductor with flexible bonding jumper.
    3) Barbed Wire: Strands must be bonded to grounding conductor.

3.5 PROTECTION

A. After installation, protect grounding and bonding cables and equipment from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION

SECTION 26 05 29
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Support, anchorage, and attachment components.
2. Fabricated metal equipment support assemblies.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260011 "Facility Performance Requirements for Electrical" for seismic-load, wind-load, acoustical, and other field conditions applicable to Work specified in this Section.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:

   a. Slotted support systems, hardware, and accessories.
   b. Clamps.
   c. Hangers.
   d. Sockets.
   e. Eye nuts.
   f. Fasteners.
   g. Anchors.
   h. Saddles.
   i. Brackets.

2. Include rated capacities and furnished specialties and accessories.

B. Shop Drawings: For fabrication and installation details for electrical hangers and support systems.

1. Hangers. Include product data for components.

2. Slotted support systems.
3. Equipment supports.
4. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

C. Delegated Design Submittals: For hangers and supports for electrical systems.

1. Include design calculations and details of hangers.
2. Include design calculations for seismic restraints.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified structural professional engineer to design hanger and support system.
B. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame Rating: Class 1.
2. Self-extinguishing according to ASTM D635.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32 inch diameter holes at a maximum of 8 inch on center in at least one surface.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Cooper B-Line.
b. Thomas & Betts.
c. Unistrut.

2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
3. Material for Channel, Fittings, and Accessories: Galvanized steel.
4. Channel Width: Selected for applicable load criteria.
5. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.

6. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
7. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
8. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with minimum 13/32 inch diameter holes at a maximum of 8 inch on center, in at least one surface.

1. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
2. Channel Width: Selected for applicable load criteria.
3. Fittings and Accessories: Products provided by channel and angle manufacturer and designed for use with those items.
4. Fitting and Accessory Materials: Same as those for channels and angles.
5. Rated Strength: Selected to suit applicable load criteria.
6. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs must have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body must be made of malleable iron.
E. Structural Steel for Fabricated Supports and Restraints: ASTM A36/A36M steel plates, shapes, and bars; black and galvanized.
F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

a. Manufacturers: Subject to compliance with requirements, provide products by the following:

1) DeWalt.
2) Hilti, Inc.
3) Simpson Strong-Tie.

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

    a. Manufacturers: Subject to compliance with requirements, provide products by the following:

        1) DeWalt.
        2) Hilti, Inc.
        3) Simpson Strong-Tie.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM F3125/F3125M, Grade A325.
6. Toggle Bolts: All steel springhead type.
7. Hanger Rods: Threaded steel.

PART 3 - EXECUTION

3.1 SELECTION

A. Comply with the following standards for selection and installation of hangers and supports, except where requirements on Drawings or in this Section are stricter:

    1. NECA NEIS 101
    2. NECA NEIS 105.

B. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.
C. Comply with requirements for raceways specified in Section 260533.13 "Conduits for Electrical Systems."
D. Comply with requirements for boxes specified in Section 260533.16 "Boxes and Covers for Electrical Systems."
E. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and ERMC as required by NFPA 70. Minimum rod size must be 1/4 inch in diameter.

F. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

   1. Secure raceways and cables to these supports with two-bolt conduit clamps.

G. 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.

3.2 INSTALLATION OF SUPPORTS

A. Comply with NECA NEIS 101 for installation requirements except as specified in this article.
B. Raceway Support Methods: In addition to methods described in NECA NEIS 1, EMT, IMC and ERMC may be supported by openings through structure members, in accordance with NFPA 70.
C. Strength of 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 must be weight of supported components plus 200 lb.
D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

   1. To Wood: Fasten with lag screws or through bolts.
   2. To New Concrete: Bolt to concrete inserts.
   3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
   4. To Existing Concrete: Expansion anchor fasteners.
   5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inch thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inch thick.
   6. To Steel: Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69.
   7. To Light Steel: Sheet metal screws.
   8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that comply with seismic-restraint strength and anchorage requirements.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 PAINTING

A. Touchup:

1. 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.

    a. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

END OF SECTION

SECTION 26 05 33.13
CONDUITS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Type EMT-A and Type EMT-SS duct raceways and elbows.
2. Type HDPE and Type EPEC duct raceways and fittings.
3. Type ERMC-A and Type ERMC-SS duct raceways, elbows, couplings, and nipples.
4. Type FMC-S and Type FMC-A duct raceways.
5. Type LFMC duct raceways.
6. Type PVC duct raceways and fittings.
7. Fittings for conduit, tubing, and cable.
8. Electrically conductive corrosion-resistant compounds for threaded conduit.

B. Products Installed, but Not Furnished, under This Section:

1. See Section 260553 "Identification for Electrical Systems" for electrical equipment labels.

C. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260011 "Facility Performance Requirements for Electrical" for seismic-load, wind-load, acoustical, and other field conditions applicable to Work specified in this Section.
3. Section 260519 "Low-Voltage for Electrical Power Conductors and Cables" for nonmetallic underground conduit with conductors (Type NUCC).
4. Section 260543 "Underground Ducts and Raceways for Electrical Systems" for exterior duct banks, manholes, and underground utility construction.

1.2 DEFINITIONS

A. Conduit: A structure containing one or more duct raceways.

B. Duct Raceway: A single enclosed raceway for conductors or cable.

1.3 ACTION SUBMITTALS

A. Product Data: Submit for each type of product provided.

PART 2 - PRODUCTS

2.1 TYPE EMT-A AND TYPE EMT-SS DUCT RACEWAYS AND ELBOWS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
2. Listing Criteria: UL CCN FJMX; including UL 797A.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL FJMX - Aluminum Electrical Metal Tubing (EMT-A) and Elbows:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. AFC Cable
    b. Allied Tube
    c. Electri-Flex

2. Material: Aluminum.
3. Options:

    a. Minimum Trade Size: Metric designator 21 (trade size 3/4).
    b. Colors: As indicated on Drawings.

D. UL FJMX - Stainless Steel Electrical Metal Tubing (EMT-SS) and Elbows:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AFC Cable
b. Allied Tube
c. Electri-Flex

2. Material: Stainless steel.
3. Options:

a. Minimum Trade Size: Metric designator 21 (trade size 3/4).
b. Colors: As indicated on Drawings.

2.2 TYPE EMT-S DUCT RACEWAYS AND ELBOWS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
2. Listing Criteria: UL CCN FJMX; including UL 797.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL FJMX - Steel Electrical Metal Tubing (EMT-S) and Elbows:

1. Manufacturers: Subject to compliance with requirements provide products by one of the following:

a. AFC Cable
b. Allied Tube
c. Electri-Flex

2. Material: Steel.
3. Options:

a. Exterior Coating: Zinc.
b. Interior Coating: Zinc.
c. Minimum Trade Size: Metric designator 21 (trade size 3/4).
d. Colors: As indicated on Drawings.

2.3 TYPE HDPE AND TYPE EPEC DUCT RACEWAYS AND FITTINGS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
2. Listing Criteria: UL CCN EAZX; including UL 651A.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL EAZX - Schedule 40 Electrical HDPE Underground Conduit (HDPE-40):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Petroflex North America.
    b. Prysmian Cables and Systems; Prysmian Group North America.
    c. Southwire Company, LLC.

2. Dimensional Specifications: Schedule 40.
3. Options:

    a. Minimum Trade Size: Metric designator 21 (trade size 3/4).

D. UL EAZX - Schedule 80 Electrical HDPE Underground Conduit (HDPE-80):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Petroflex North America.
    b. Prysmian Cables and Systems; Prysmian Group North America.
    c. Southwire Company, LLC.

2. Dimensional Specifications: Schedule 80.
3. Options:

    a. Minimum Trade Size: Metric designator 21 (trade size 3/4).

2.4 TYPE ERMC-A AND TYPE ERMC-SS DUCT RACEWAYS, ELBOWS, COUPLINGS, AND NIPPLES

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
2. Listing Criteria: UL CCN DYWV; including UL 6A.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL DYWV - Aluminum Electrical Rigid Metal Conduit (ERMC-A), Elbows, Couplings, and Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Appleton; Emerson Electric Co., Automation Solutions.
    b. Crouse-Hinds; brand of Eaton, Electrical Sector.
    c. Killark; brand of Hubbell Electrical Solutions; Hubbell Incorporated.

2. Material: Aluminum.
3. Options:

    a. Protective Coating: Provide protective coating for direct burial and use in severely corrosive environment.
    b. Minimum Trade Size: Metric designator 21 (trade size 3/4).
    c. Colors: As indicated on Drawings.

D. UL DYWV - Stainless Steel Electrical Rigid Metal Conduit (ERMC-SS), Elbows, Couplings, and Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Allied Tube & Conduit; Atkore International.
    b. Crouse-Hinds; brand of Eaton, Electrical Sector.
    c. Patriot Aluminum Products, LLC.

2. Material: Stainless steel.

3. Options:

    a. Minimum Trade Size: Metric designator 21 (trade size 3/4)
    b. Colors: As indicated on Drawings.

2.5 TYPE ERMC-S DUCT RACEWAYS, ELBOWS, COUPLINGS, AND NIPPLES

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
2. Listing Criteria: UL CCN DYIX; including UL 6.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL DYIX - Galvanized-Steel Electrical Rigid Metal Conduit (ERMC-S-G), Elbows, Couplings, and Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Allied Tube & Conduit; Atkore International.
    b. Crouse-Hinds; brand of Eaton, Electrical Sector.
    c. Killark; brand of Hubbell Electrical Solutions; Hubbell Incorporated.

2. Exterior Coating: Zinc.
3. Options:

    a. Interior Coating: Zinc.
    b. Minimum Trade Size: Metric designator 21 (trade size 3/4).
    c. Colors: As indicated on Drawings.

2.6 TYPE FMC-S AND TYPE FMC-A DUCT RACEWAYS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by

authorities having jurisdiction and marked for intended location and application.
2. Listing Criteria: UL CCN DXUZ; including UL 1.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL DXUZ - Steel Flexible Metal Conduit (FMC-S):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AFC Cable.
b. Allied Tube.
c. Electri-Flex Company.

2. Material: Steel.
3. Options:

a. Minimum Trade Size: Metric designator 21 (trade size 3/4).
b. Colors: As indicated on Drawings.

D. UL DXUZ - Aluminum Flexible Metal Conduit (FMC-A):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AFC Cable.
b. Allied Tube.
c. Electri-Flex Company.

2. Options:

a. Minimum Trade Size: Metric designator 21 (trade size 3/4).
b. Colors: As indicated on Drawings.

2.7 TYPE LFMC DUCT RACEWAYS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by

authorities having jurisdiction and marked for intended location and application.
2. Listing Criteria: UL CCN DXHR; including UL 360.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL DXHR - Steel Liquid-tight Flexible Metal Conduit (LFMC-S):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AFC Cable.
b. Allied Tube.
c. Electri-Flex Company.

2. Material: Steel.
3. Options:

a. Minimum Trade Size: Metric designator 21 (trade size 3/4).
b. Colors: As indicated on Drawings.

D. UL DXHR - Stainless Steel Liquidtight Flexible Metal Conduit (LFMC-SS):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AFC Cable.
b. Allied Tube.
c. Electri-Flex Company.

2. Material: Stainless steel.
3. Options:

a. Minimum Trade Size: Metric designator 21 (trade size 3/4).
b. Colors: As indicated on Drawings.

2.8 TYPE PVC DUCT RACEWAYS AND FITTINGS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by

authorities having jurisdiction and marked for intended location and application.
2. Listing Criteria: UL CCN DZYR; including UL 651.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL DZYR - Schedule 40 Rigid PVC Conduit (PVC-40) and Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AFC Cable.
b. Allied Tube.
c. Electri-Flex Company.

2. Dimensional Specifications: Schedule 40.
3. Options:

a. Minimum Trade Size Metric designator 21 (trade size 3/4).
b. Markings: For use with maximum 90 deg C wire.

D. UL DZYR - Schedule 80 Rigid PVC Conduit (PVC-80) and Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AFC Cable.
b. Allied Tube.
c. Electri-Flex Company.

2. Dimensional Specifications: Schedule 80.
3. Options:

a. Minimum Trade Size: Metric designator 21 (trade size 3/4).
b. Markings: For use with maximum 90 deg C wire.

2.9 FITTINGS FOR CONDUIT, TUBING, AND CABLE

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by

authorities having jurisdiction and marked for intended location and application.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL DWTT - Fittings for Type ERMC, Type IMC, Type PVC, Type HDPE, Type EPEC, and Type RTRC Duct Raceways:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Appleton; Emerson Electric Co., Automation Solutions.
b. Crouse-Hinds; brand of Eaton, Electrical Sector.
c. Southwire Company, LLC.

2. Listing Criteria: UL CCN DWTT; including UL 514B.
3. Options:

a. Material: Steel.
b. Coupling Method: Compression coupling.
c. Expansion and Deflection Fittings: UL 651 with flexible bonding jumper.

D. UL FKAV - Fittings for Type EMT Duct Raceways:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Appleton; Emerson Electric Co., Automation Solutions.
b. Crouse-Hinds; brand of Eaton, Electrical Sector.
c. Southwire Company, LLC.

2. Listing Criteria: UL CCN FKAV; including UL 514B.
3. Options:

a. Material: Steel.
b. Coupling Method: Compression coupling.
c. Expansion and Deflection Fittings: UL 651 with flexible bonding jumper.

E. UL ILNR - Fittings for Type FMC Duct Raceways:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Appleton; Emerson Electric Co., Automation Solutions.

b. Crouse-Hinds; brand of Eaton, Electrical Sector.
c. Southwire Company, LLC.

2. Listing Criteria: UL CCN ILNR; including UL 514B.

F. UL DXAS - Fittings for Type LFMC and Type LFNC Duct Raceways:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Appleton; Emerson Electric Co., Automation Solutions.
b. Crouse-Hinds; brand of Eaton, Electrical Sector.
c. Southwire Company, LLC.

2. Listing Criteria: UL CCN DXAS; including UL 514B.

2.10 ELECTRICALLY CONDUCTIVE CORROSION-RESISTANT COMPOUNDS FOR THREADED CONDUIT

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
2. Listing Criteria: UL CCN FOIZ; including UL Subject 2419.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

2.11 SOLVENT CEMENTS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

2. Listing Criteria: UL CCN DWTT; including UL 514B.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.

2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

PART 3 - EXECUTION

3.1 SELECTION OF CONDUITS FOR ELECTRICAL SYSTEMS

A. Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NFPA 70 for selection of duct raceways. Consult Architect for resolution of conflicting requirements.
B. Special Instructions Regarding HDPE Conduits: Although Article 353 of NFPA 70 permits use of HDPE conduits where encased in concrete aboveground, UL CCN EAZX listing requirements state that HDPE and EPEC underground conduits are intended only for use where direct buried with or without being encased in concrete. Specified Type HDPE and Type EPEC underground conduits are not permitted to be used aboveground on Project.
C. Outdoors:

1. Exposed and Subject to Severe Physical Damage: ERMC.
2. Exposed and Subject to Physical Damage: ERMC.

a. Locations less than 2.5 m (8 ft) above finished floor.

3. Exposed and Not Subject to Physical Damage: Corrosion-resistant EMT.
4. Concealed Aboveground: EMT.
5. Direct Buried: PVC-80, HDPE-80.
6. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.

D. Indoors:

1. Exposed and Subject to Severe Physical Damage: ERMC. Locations include the following:

a. Loading docks.

b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
c. Mechanical rooms.

2. Exposed and Subject to Physical Damage: ERMC. Locations include the following:

a. Locations less than 2.5 m (8 ft) above finished floor.
b. Stub-ups to above suspended ceilings.

3. Exposed and Not Subject to Physical Damage: EMT.
4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Damp or Wet Locations: Corrosion-resistant EMT.
6. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC, FMC.

E. Duct Fittings: Select fittings in accordance with NEMA FB 2.10 guidelines.

1. ERMC and IMC: Provide threaded-type fittings unless otherwise indicated.

3.2 INSTALLATION OF CONDUITS FOR ELECTRICAL SYSTEMS

A. Comply with manufacturer's published instructions.
B. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturers' published instructions, comply with the following:

1. Type EMT-A: Article 358 of NFPA 70 and NECA NEIS 102.
2. Type EMT-SS: Article 358 of NFPA 70 and NECA NEIS 101.
3. Type EMT-S: Article 358 of NFPA 70 and NECA NEIS 101.
4. Type ENT: Article 362 of NFPA 70 and NECA NEIS 102.
5. Type HDPE and Type EPEC: Article 353 of NFPA 70 and NECA NEIS 111.
6. Type ERMC-A: Article 344 of NFPA 70 and NECA NEIS 102.
7. Type ERMC-SS: Article 344 of NFPA 70 and NECA NEIS 101.
8. Type ERMC-S: Article 344 of NFPA 70 and NECA NEIS 101.
9. Type FMC-S: Article 348 of NFPA 70 and NECA NEIS 101.
10. Type FMC-A: Article 348 of NFPA 70 and NECA NEIS 102.
11. Type FMT: Article 360 of NFPA 70 and NECA NEIS 101.
12. Type IMC: Article 342 of NFPA 70 and NECA NEIS 101.
13. Type LFMC: Article 350 of NFPA 70 and NECA NEIS 101.
14. Type LFNC: Article 342 of NFPA 70 and NECA NEIS 111.
15. Type PVC: Article 356 of NFPA 70 and NECA NEIS 111.
16. Type RTRC: Article 355 of NFPA 70 and NECA NEIS 111.
17. Expansion Fittings: NEMA FB 2.40.
18. Consult Architect for resolution of conflicting requirements.

C. Special Installation Techniques:

1. General Requirements for Installation of Duct Raceways:

a. Complete duct raceway installation before starting conductor installation.
b. Provide stub-ups through floors with coupling threaded inside for plugs, set flush with finished floor. Plug coupling until conduit is extended above floor to final destination or a minimum of 2 ft above finished floor.
c. Install no more than equivalent of three 90-degree bends in conduit run. Support within 12 inches of changes in direction.
d. Make bends in duct raceway using large-radius preformed ells except for parallel bends. Field bending must be in accordance with NFPA 70 minimum radii requirements. Provide only equipment specifically designed for material and size involved.
e. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
f. Support conduit within 12 inches of enclosures to which attached.
g. Install duct sealing fittings at accessible locations in accordance with NFPA 70 and fill them with listed sealing compound. For concealed duct raceways, install fitting in flush steel box with blank cover plate having finish similar to that of adjacent plates or surfaces. Install duct sealing fittings in accordance with NFPA 70.
h. Install devices to seal duct raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal interior of duct raceways at the following points:

1) Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2) Where an underground service duct raceway enters a building or structure.
3) Conduit extending from interior to exterior of building.
4) Conduit extending into pressurized duct raceway and equipment.
5) Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
6) Where otherwise required by NFPA 70.

i. Do not install duct raceways or electrical items on "explosion-relief" walls or rotating equipment.
j. Do not install conduits within 2 inches of the bottom side of a metal deck roof.
k. Keep duct raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal duct raceway runs above water and steam piping.

l. Cut conduit perpendicular to the length. For conduits metric designator 53 (trade size 2) and larger, use roll cutter or a guide to make cut straight and perpendicular to the length. Ream inside of conduit to remove burrs.
m. Install pull wires in empty duct raceways. Provide polypropylene or monofilament plastic line with not less than 200 lb tensile strength. Leave at least 12 inches of slack at both ends of pull wire. Cap underground duct raceways designated as spare above grade alongside duct raceways in use.
n. Install duct raceways square to the enclosure and terminate at enclosures without hubs with locknuts on both sides of enclosure wall. Install locknuts hand tight, plus one-quarter turn more.

    1) Termination fittings with shoulders do not require two locknuts.

o. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to metric designator 35 (trade size 1-1/4) and insulated throat metal bushings on metric designator 41 (trade size 1-1/2) and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

2. Types EMT-A, ERMC-A, and FMC-A: Do not install aluminum duct raceways or fittings in contact with concrete or earth.
3. Types ERMC and IMC:

    a. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound that maintains electrical conductivity to threads of duct raceway and fittings before making up joints. Follow compound manufacturer's published instructions.

4. Type ERMC-S-PVC:

    a. Follow manufacturer's installation instructions for clamping, cutting, threading, bending, and assembly.
    b. Provide PVC-coated sealing locknut for exposed male threads transitioning into female NPT threads that do not have sealing sleeves, including transitions from PVC couplings/female adapters to Type ERMC-S-PVC elbows in direct-burial applications. PVC-coated sealing locknuts must not be used in place of conduit hub. PVC-coated sealing locknut must cover exposed threads on Type ERMC-S-PVC duct raceway.
    c. Coat field-cut threads on PVC-coated duct raceway with manufacturer-approved corrosion-preventing conductive compound prior to assembly.

5. Types FMC, LFMC, and LFNC:

a. Provide a maximum of 36 inches of flexible conduit for recessed and semi-recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

6. Types PVC, HDPE, and EPEC:

   a. Do not install Type PVC, Type HDPE, or Type EPEC conduit where ambient temperature exceeds 122 deg F. Conductor ratings must be limited to 75 deg C except where installed in a trench outside buildings with concrete encasement, where 90 deg C conductors are permitted.
   b. Comply with manufacturer's published instructions for solvent welding and fittings.

7. Type RTRC: Do not install Type RTRC conduit where ambient temperature exceeds 230 deg F.
8. Duct Raceways Embedded in Slabs:
9. Stub-ups to Above Recessed Ceilings:

   a. Provide EMT, IMC, or ERMC for duct raceways.
   b. Provide a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

10. Duct Raceway Terminations at Locations Subject to Moisture or Vibration:

    a. Provide insulating bushings to protect conductors, including conductors smaller than 4 AWG.

11. Duct Fittings: Install fittings in accordance with NEMA FB 2.10 guidelines.

    a. ERMC-S-PVC: Provide only fittings listed for use with this type of conduit. Patch and seal joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Provide sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
    b. EMT: Provide setscrew compression, steel cast-metal fittings. Comply with NEMA FB 2.10.
    c. Flexible Conduit: Provide only fittings listed for use with flexible conduit type. Comply with NEMA FB 2.20.

12. Expansion-Joint Fittings:

    a. Install in runs of aboveground PVC that are located where environmental temperature change may exceed 30 deg F and that have straight-run length that exceeds 25 ft. Install in runs of aboveground ERMC conduit that are located where environmental temperature change may exceed 100 deg F and that have straight-run length that exceeds 100 ft.

b. Install type and quantity of fittings that accommodate temperature change listed for the following locations:

1) Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
2) Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
3) Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
4) Attics: 135 deg F temperature change.

c. 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.
d. Install expansion fittings at locations where conduits cross building or structure expansion joints.
e. Install expansion-joint fitting with position, mounting, and piston setting selected in accordance with manufacturer's published instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

13. Duct Raceways Penetrating Rooms or Walls with Acoustical Requirements: Seal duct raceway openings on both sides of rooms or walls with acoustically rated putty or firestopping.
14. Identification: Provide labels for conduit assemblies, duct raceways, and associated electrical equipment.

a. Provide warning signs.

D. Interfaces with Other Work:

1. Coordinate with Section 078413 "Penetration Firestopping" for installation of firestopping at penetrations of fire-rated floor and wall assemblies.
2. Coordinate with Section 260529 "Hangers and Supports for Electrical Systems" for installation of conduit hangers and supports.

3.3 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and 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

SECTION 26 05 33.16
BOXES AND COVERS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metallic outlet boxes, device boxes, rings, and covers.
2. Nonmetallic outlet boxes, device boxes, rings, and covers.
3. Junction boxes and pull boxes.
4. Cover plates for device boxes.
5. Hoods for outlet boxes.

B. Products Installed, but Not Furnished, under This Section:

1. See Section 260553 "Identification for Electrical Systems" for electrical equipment labels.

C. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260011 "Facility Performance Requirements for Electrical" for seismic-load, wind-load, acoustical, and other field conditions applicable to Work specified in this Section.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Metallic outlet boxes, device boxes, rings, and covers.
2. Nonmetallic outlet boxes, device boxes, rings, and covers.
3. Junction boxes and pull boxes.
4. Cover plates for device boxes.
5. Hoods for outlet boxes.

1.3 INFORMATIONAL SUBMITTALS

A. Manufacturers' Published Instructions:

1. Metallic outlet boxes, device boxes, rings, and covers.
2. Nonmetallic outlet boxes, device boxes, rings, and covers.
3. Junction boxes and pull boxes.
4. Cover plates for device boxes.
5. Hoods for outlet boxes.

PART 2 - PRODUCTS

2.1 METALLIC OUTLET BOXES, DEVICE BOXES, RINGS, AND COVERS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
2. Listing Criteria: UL CCN QCIT; including UL 514A.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.
3. Samples:

    a. Floor Box Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors and flooring inserts for each type of floor box.
    b. Raised Floor Box Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors and flooring inserts for each type of floor box.
    c. Recessed Access-Floor Box Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors and flooring inserts for each type of floor box.
    d. Concrete Box Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors and flooring inserts for each type of floor box.

C. UL QCIT - Metallic Outlet Boxes and Covers:

1. Description: Box having pryout openings, knockouts, threaded entries, or hubs in either the sides of the back, or both, for entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting outlet box cover, but without provisions for mounting wiring device directly to box.

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Appleton; Emerson Electric Co., Automation Solutions.
    b. Crouse-Hinds; brand of Eaton, Electrical Sector.
    c. Hubbell Premise Wiring; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
    d. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
    e. Wiremold; Legrand North America, LLC.

3. Options:

    a. Material: Sheet steel.
    b. Sheet Metal Depth: Minimum 2 inch.
    c. Cast-Metal Depth: Minimum 2.4 inch.
    d. Luminaire Outlet Boxes and Covers: Nonadjustable, listed and labeled for attachment of luminaire weighing up to 50 lb.
    e. Paddle Fan Outlet Boxes and Covers: Nonadjustable, designed for attachment of paddle fan weighing up to 70 lb.

D. UL QCIT - Metallic Conduit Bodies:

1. Description: Means for providing access to interior of conduit or tubing system through one or more removable covers at junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Appleton; Emerson Electric Co., Automation Solutions.
    b. Crouse-Hinds; brand of Eaton, Electrical Sector.
    c. Hubbell Premise Wiring; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
    d. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
    e. Wiremold; Legrand North America, LLC.

E. UL QCIT - Metallic Device Boxes:

1. Description: Box with provisions for mounting wiring device directly to box.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Appleton; Emerson Electric Co., Automation Solutions.
    b. Crouse-Hinds; brand of Eaton, Electrical Sector.
    c. Hubbell Premise Wiring; brand of Hubbell Electrical Solutions; Hubbell Incorporated.

d. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
e. Wiremold; Legrand North America, LLC.

3. Options:

a. Material: Sheet steel.
b. Sheet Metal Depth: minimum 2 inch.
c. Cast-Metal Depth: minimum 2.4 inch.

F. UL QCIT - Metallic Extension Rings:

1. Description: Ring intended to extend sides of outlet box or device box to increase box depth, volume, or both.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Appleton; Emerson Electric Co., Automation Solutions.
b. Crouse-Hinds; brand of Eaton, Electrical Sector.
c. Hubbell Premise Wiring; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
d. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
e. Wiremold; Legrand North America, LLC.

2.2 NONMETALLIC OUTLET BOXES, DEVICE BOXES, RINGS, AND COVERS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. Listing Criteria: UL CCN QCMZ; including UL 514C.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. Covers:

1. Description: Box having pryout openings, knockouts, threaded entries, or hubs in either the sides or the back, or both, for entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting outlet box cover, but without provisions for mounting wiring device directly to box.

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Carson Industries LLC.
    b. Synertech Moulded Products, Inc.

D. UL QCMZ - Nonmetallic Conduit Bodies:

1. Description: Means for providing access to interior of conduit or tubing system through one or more removable covers at junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Carson Industries LLC.
    b. Synertech Moulded Products, Inc.

E. UL QCMZ - Nonmetallic Device Boxes:

1. Description: Box with provisions for mounting wiring device directly to box.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Carson Industries LLC.
    b. Synertech Moulded Products, Inc.

F. UL QCMZ - Nonmetallic Extension Rings:

1. Description: Ring intended to extend sides of outlet box or device box to increase box depth, volume, or both.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Carson Industries LLC.
    b. Synertech Moulded Products, Inc.

2.3 JUNCTION BOXES AND PULL BOXES

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. Listing Criteria: UL CCN BGUZ; including UL 50 and UL 50E.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL BGUZ - Indoor Sheet Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Appleton; Emerson Electric Co., Automation Solutions.
    b. Crouse-Hinds; brand of Eaton, Electrical Sector.
    c. Hubbell Premise Wiring; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
    d. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
    e. Wiremold; Legrand North America, LLC.

3. Options:

    a. Degree of Protection: Type 1.

D. UL BGUZ - Indoor Cast-Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Appleton; Emerson Electric Co., Automation Solutions.
    b. Crouse-Hinds; brand of Eaton, Electrical Sector.
    c. Hubbell Premise Wiring; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
    d. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
    e. Wiremold; Legrand North America, LLC.

3. Options:

    a. Degree of Protection: Type 1.

E. UL BGUZ - Outdoor Sheet Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Appleton; Emerson Electric Co., Automation Solutions.
    b. Crouse-Hinds; brand of Eaton, Electrical Sector.
    c. Hubbell Premise Wiring; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
    d. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
    e. Wiremold; Legrand North America, LLC.

3. Options:

    a. Degree of Protection: Type 3R.

F. UL BGUZ - Outdoor Cast-Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Appleton; Emerson Electric Co., Automation Solutions.
    b. Crouse-Hinds; brand of Eaton, Electrical Sector.
    c. Hubbell Premise Wiring; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
    d. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
    e. Wiremold; Legrand North America, LLC.

3. Options:

    a. Degree of Protection: Type 3R.

G. UL BGUZ - Outdoor Polymeric Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Appleton; Emerson Electric Co., Automation Solutions.
    b. Crouse-Hinds; brand of Eaton, Electrical Sector.
    c. Hubbell Premise Wiring; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
    d. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
    e. Wiremold; Legrand North America, LLC.

3. Options:

    a. Degree of Protection: Type 3R.

2.4 COVER PLATES FOR DEVICES BOXES

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. Listing Criteria: UL CCN QCIT or UL CCN QCMZ; including UL 514D.
3. Wallplate-Securing Screws: Metal with head color to match wallplate finish.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL QCIT or QCMZ - Metallic Cover Plates for Device Boxes:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Appleton; Emerson Electric Co., Automation Solutions.
    b. Crouse-Hinds; brand of Eaton, Electrical Sector.
    c. Hubbell Premise Wiring; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
    d. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
    e. Wiremold; Legrand North America, LLC.

2. Options:

    a. Damp and Wet Locations: Listed, labeled, and marked for location and use. Provide gaskets and accessories necessary for compliance with listing.
    b. Wallplate Material: 0.032 inch thick, Type 302/304 non-magnetic stainless steel with brushed finish.

D. UL QCIT or QCMZ - Nonmetallic Cover Plates for Device Boxes:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Appleton; Emerson Electric Co., Automation Solutions.
    b. Crouse-Hinds; brand of Eaton, Electrical Sector.

c. Hubbell Premise Wiring; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
d. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
e. Wiremold; Legrand North America, LLC.

2. Options:

a. Damp and Wet Locations: Listed, labeled, and marked for location and use. Provide gaskets and accessories necessary for compliance with listing.
b. Wallplate Material: As indicated on architectural Drawings.
c. Color: Ivory.

2.5 HOODS FOR OUTLET BOXES

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. Listing Criteria:

a. UL CCN QCIT or UL CCN QCMZ; including UL 514D.
b. Receptacle, Hood, Cover Plate, Gaskets, and Seals: UL 498 Supplement SA when mated with box or enclosure complying with UL 514A, UL 514C, or UL 50E.

3. Mounts to box using fasteners different from wiring device.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL QCIT or QCMZ - Retractable or Reattachable Hoods for Outlet Boxes:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Appleton; Emerson Electric Co., Automation Solutions.
b. Leviton Manufacturing Co., Inc.
c. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.

2. Options:

a. Provides clear, weatherproof, "while-in-use" cover.

D. UL QCIT or QCMZ - Extra-Duty, While-in-Use Hoods for Outlet Boxes:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Appleton; Emerson Electric Co., Automation Solutions.
b. Leviton Manufacturing Co., Inc.
c. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.

PART 3 - EXECUTION

3.1 PREPARATION

A. Shop Drawings: Prepare and submit the following:

1. Shop Drawings for Floor Boxes: Show that floor boxes are located to avoid interferences and are structurally allowable. Indicate floor thickness at location where boxes are embedded in concrete floors and underfloor clearances where boxes are installed in raised floors.

3.2 SELECTION OF BOXES AND COVERS FOR ELECTRICAL SYSTEMS

A. Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NFPA 70 for selection of boxes and enclosures. Consult Architect for resolution of conflicting requirements.
B. Degree of Protection:

1. Outdoors:

a. Locations Exposed to Hosedown: Type 6P.
b. Locations Subject to Potential Flooding: Type 6P.
c. Locations Aboveground Where Mechanism Must Operate When Ice Covered: Type 3S.
d. Locations in-Ground or Exposed to Corrosive Agents: Type 4X.
e. Locations in-Ground or Exposed to Corrosive Agents Where Mechanism Must Operate When Ice Covered: Type 3SX.

2. Indoors:

    a. Type 1 unless otherwise indicated.
    b. Damp or Dusty Locations: Type 12.
    c. Surface Mounted in Kitchens and Other Locations Exposed to Oil or Coolants: Type 12.
    d. Flush Mounted in Kitchens and Other Locations Exposed to Oil or Coolants: Type 12.
    e. Locations Exposed to Airborne Dust, Lint, Fibers, or Flyings: Type 4.
    f. Locations Exposed to Hosedown: Type 6P.
    g. Locations Exposed to Brief Submersion: Type 6P.
    h. Locations Exposed to Prolonged Submersion: Type 6P.
    i. Locations Exposed to Corrosive Agents: Type 4X.
    j. Locations Exposed to Spraying Oil or Coolants: Type 13.

C. Exposed Boxes Installed Less Than 2.5 m (8 ft) Above Floor:

1. Provide cast-metal boxes.
2. Provide exposed cover. Flat covers with angled mounting slots or knockouts are prohibited.

3.3 INSTALLATION OF BOXES AND COVERS FOR ELECTRICAL SYSTEMS

A. Comply with manufacturer's published instructions.
B. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturers' published instructions, comply with the following:

1. Outlet, Device, Pull, and Junction Boxes: Article 314 of NFPA 70.
2. Consult Architect for resolution of conflicting requirements.

C. Special Installation Techniques:

1. Provide boxes in wiring and raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures.
2. 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 bottom of box unless otherwise indicated.
3. 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 surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box, whether installed indoors or outdoors.
4. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

5. Locate boxes so that cover or plate will not span different building finishes.
6. Support boxes in recessed ceilings independent of ceiling tiles and ceiling grid.
7. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for purpose.
8. Fasten junction and pull boxes to, or support from, building structure. Do not support boxes by conduits.
9. Set metal floor boxes level and flush with finished floor surface.
10. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.
11. Do not install aluminum boxes, enclosures, or fittings in contact with concrete or earth.
12. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to ensure a continuous ground path.
13. Boxes and Enclosures in Areas or Walls with Acoustical Requirements:

    a. Seal openings and knockouts in back and sides of boxes and enclosures with acoustically rated putty.
    b. Provide gaskets for wallplates and covers.

14. Identification: Provide labels for boxes and associated electrical equipment.

    a. Identify field-installed conductors, interconnecting wiring, and components.
    b. Provide warning signs.
    c. Label each box with engraved metal or laminated-plastic nameplate.

3.4 CLEANING

A. Remove construction dust and debris from boxes before installing wallplates, covers, and hoods.

3.5 PROTECTION

A. After installation, protect boxes from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION

SECTION 26 05 48.16
SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Restraints - rigid type.
2. Restraints - cable type.
3. Restraint accessories.
4. Post-installed concrete anchors.
5. Concrete inserts.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260011 "Facility Performance Requirements for Electrical" for seismic-load, wind-load, acoustical, and other field conditions applicable to Work specified in this Section.
3. Section 260529 "Hangers and Supports for Electrical Systems" for commonly used electrical supports and installation requirements.

1.2 DEFINITIONS

A. OSHPD: Office of Statewide Health Planning and Development (for the State of California owned and regulated medical facilities).

1.3 COORDINATION

A. Tests and Inspections:

1. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved) and provide notice at least seven days in advance.
2. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.

1.4 ACTION SUBMITTALS

A. Product Data:

1. Restraints - rigid type.
2. Restraints - cable type.
3. Restraint accessories.
4. Post-installed concrete anchors.
5. Concrete inserts.

B. Shop Drawings: Show coordination of seismic and wind-load bracing for components with other systems and equipment in the vicinity, including other supports and seismic restraints.
C. Delegated Design Submittal for Each Seismic-Restraint Device: Signed and sealed by qualified structural professional engineer.
D. Delegated Design Submittal for Each Wind-Load Protection Device: Signed and sealed by qualified structural professional engineer.
E. Field quality-control reports.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified structural professional engineer to design seismic and wind-load control system in accordance with criteria specified in Section 260010 "Supplemental Requirements for Electrical" and Section 260011 "Facility Performance Requirements for Electrical."
B. Seismic- and Wind-Load-Restraint Device Load Ratings: Devices to be tested and rated in accordance with applicable code requirements and authorities having jurisdiction. Devices to be listed by a nationally recognized third party that requires periodic follow-up inspections and has a listing directory available to the public. Provide third-party listing by one or more of the following: ICC-ES product listing, UL product listing, FM Approvals, an agency acceptable to authorities having jurisdiction.
C. Consequential Damage: Provide additional seismic and wind-load restraints for suspended components or anchorage of floor-, roof-, or wall-mounted components so that failure of a non-essential or essential component does not cause failure of any other essential building component.
D. Fire/Smoke Resistance: Seismic- and wind-load-restraint devices that are not constructed of ferrous metals must have a maximum flame-spread index of

25 and maximum smoke-developed index of 50 when tested and labeled by qualified testing laboratory in accordance with ASTM E84 or UL 723.

E. Component Supports:

1. Load ratings, features, and applications of all reinforcement components must be based on testing standards of qualified testing laboratory.

2.2 RESTRAINTS - RIGID TYPE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Atkore Unistrut.
2. B-Line; a division of Eaton, Electrical Sector.
3. Hilti, Inc.

B. Description: Shop- or field-fabricated bracing assembly made of ANSI/AISI S110-07-S1 slotted steel channels, ANSI/ASTM A53/A53M steel pipe, or other rigid steel brace member. Includes accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.3 RESTRAINTS - CABLE TYPE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CADDY; brand of nVent Electrical plc.
2. Gripple Inc.
3. Kinetics Noise Control, Inc.

B. Seismic- and Wind-Load-Restraint Cables: ASTM A1023/A1023M galvanized or ASTM A603 galvanized-steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for seismic-restraining cable service; with fittings attached by means of poured socket, swaged socket or mechanical (Flemish eye) loop.

C. Restraint cable assembly and cable fittings must comply with ASCE/SEI 19. Cable fittings and complete cable assembly must maintain the minimum cable breaking force. U-shaped cable clips and wedge-type end fittings do not comply and are unacceptable.

2.4 RESTRAINT ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   1. B-Line; a division of Eaton, Electrical Sector.
   2. Kinetics Noise Control, Inc.
   3. Mason Industries, Inc.

B. Hanger-Rod Stiffener: [Steel tube or steel slotted-support-system sleeve with internally bolted connections] to hanger rod. Non-metallic stiffeners are unacceptable.
C. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid channel bracings and restraint cables.
D. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings and matched to type and size of anchor bolts and studs.
E. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings and matched to type and size of attachment devices used.
F. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.5 SOURCE QUALITY CONTROL

A. Product Data: Prepare and submit catalog cuts, brochures, diagrams, schedules, and performance data illustrating size, physical appearance, and other characteristics of product.

   1. Include rated load capacity for each seismic- and wind-load-restraint device.
   2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic- and wind-load-restraint component used.
   3. Annotate types and sizes of seismic restraints and accessories, complete with listing markings or report numbers and load rating in tension and compression as evaluated by OSHPD.
   4. Annotate to indicate application of each product submitted and compliance with requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive seismic and wind-load control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
B. Examine roughing-in for reinforcement and cast-in-place anchors to verify actual locations before installation.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by OSHPD.
B. Hanger-Rod Stiffeners: Install where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods caused by seismic forces.
C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry static, wind load, and seismic loads within specified loading limits.

3.3 INSTALLATION OF SEISMIC-RESTRAINT AND WIND-LOAD CONTROL DEVICES

A. Provide seismic-restraint and wind-load control devices for systems and equipment where indicated in Equipment Schedules or Seismic and Wind-Load Controls Schedule, where indicated on Drawings, where the Specifications indicate they are to be installed on specific equipment and systems, and where required by applicable codes.

    1. Install equipment and devices to withstand the effects of earthquake motions and high wind events.

B. Coordinate location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."
C. Installation of seismic and wind-load restraints must not cause any stresses, misalignment, or change of position of equipment or conduits.

D. Equipment Restraints:

1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
2. Install seismic-restraint and wind-load-restraint devices using methods approved by OSHPD that provides required submittals for component.

E. Raceway, Cable, Wireway, Cable Tray, and Busway Support and Hanger Restraints:

1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
2. Install seismic-restraint and wind-load-restraint devices using methods approved by OSHPD that provides required submittals for component.

F. Equipment and Hanger Restraints:

1. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
2. Install seismic-restraint devices using methods approved by OSHPD providing required submittals for component.

G. Install cables so they do not bend across edges of adjacent equipment or building structure.
H. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
I. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
J. Post-Installed Concrete Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Mechanical-Type Anchor Bolts: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors must be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.

4. Adhesive-Type Anchor Bolts: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where connection is terminated to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

3.5 FIELD QUALITY CONTROL

A. Field tests must be witnessed by authorities having jurisdiction.
B. Tests and Inspections:

   1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
   2. Test no fewer than four of each type and size of installed anchors and fasteners selected by Architect.
   3. Test to 90 percent of rated proof load of device.

C. Nonconforming Work:

   1. Seismic controls will be considered defective if they do not pass tests and inspections.
   2. Remove and replace malfunctioning units and retest as specified above.

D. Field Quality-Control Reports: Collect, assemble, and submit test and inspection reports.

END OF SECTION

SECTION 26 05 53
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Labels.
2. Extruded insulating tubing.
3. Bands.
4. Tapes and stencils.
5. Tags.
6. Signs.
7. Cable ties.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260011 "Facility Performance Requirements for Electrical" for seismic-load, wind-load, acoustical, and other field conditions applicable to Work specified in this Section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 LABELS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
2. Listing Criteria: UL CCN PGDQ2 for components; including UL 969.

B. UL PGDQ2 - Vinyl Wraparound Labels: Preprinted, flexible labels laminated with clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Brady Corporation.
b. Marking Services Inc.
c. Panduit Corp.

C. UL PGDQ2 - Self-Adhesive Wraparound Labels: Preprinted, 3 mil thick, vinyl flexible label with acrylic pressure-sensitive adhesive.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Brady Corporation.
b. Marking Services Inc.
c. Panduit Corp.

2. Self-Lamination: Clear; UV-, weather-, and chemical-resistant; self-laminating, with protective shield over legend. Size labels such that clear shield overlaps entire printed legend.
3. Marker for Labels:

a. Permanent, waterproof, black ink marker recommended by tag manufacturer.
b. Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.

D. UL PGDQ2 - 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Brady Corporation.
b. Marking Services Inc.
c. Panduit Corp.

2. Minimum Nominal Size:

a. 1-1/2 by 6 inch for raceway and conductors.
b. 3-1/2 by 5 inch for equipment.
c. As required by authorities having jurisdiction.

2.2 EXTRUDED INSULATING TUBING

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
2. Listing Criteria: UL CCN YDPU2 for components; including UL 224.

B. UL YDPU2 - Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameter and shrunk to fit firmly. Full shrink recovery occurs at maximum of 200 deg F.

2.3 TAGS

A. Nonmetallic Preprinted Tags: Polyethylene tags, 0.023 inch thick, color-coded for phase and voltage level, with factory printed permanent designations; punched for use with self-locking cable tie fastener.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Brady Corporation.
b. Marking Services Inc.
c. Panduit Corp.

2.4 SIGNS

A. Baked-Enamel Signs:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Brady Corporation.
b. Marking Services Inc.

2. Preprinted aluminum signs, high-intensity reflective, punched or drilled for fasteners, with colors, legend, and size required for application.
3. 1/4 inch grommets in corners for mounting.
4. Nominal Size: 7 by 10 inch.

2.5 CABLE TIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Marking Services Inc.
2. Panduit Corp.

B. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
2. Listing Criteria: UL CCN ZODZ; including UL 1565 or UL 62275.

C. UL ZODZ - General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F in accordance with ASTM D638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black, except where used for color-coding.

D. UL ZODZ - UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F in accordance with ASTM D638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black.

E. UL ZODZ - Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F in accordance with ASTM D638: 7000 psi.
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F.
5. Color: Black.

PART 3 - EXECUTION

3.1 PREPARATION

A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 SELECTION OF COLORS AND IDENTIFICATION MARKINGS

A. Comply with 29 CFR 1910.144 for color identification of hazards, and the following:

1. Fire-protection and fire-alarm equipment**,** including raceways**,** must be finished, painted, or suitably marked safety red.
2. Ceiling-mounted hangers, supports, cable trays, and raceways must be finished, painted, or suitably marked safety yellow where less than 7.7 ft above finished floor.

B. Pipe and Conduit Labeling: Comply with ASME A13.1 and IEEE C2.
C. Color-Coding for Phase- and Voltage-Level Identification, 1000 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.

1. Color must be factory applied or field applied for sizes larger than 6 AWG when permitted by authorities having jurisdiction.
2. Colors for 208Y/120 V Circuits:

    a. Phase A: Black.
    b. Phase B: Red.
    c. Phase C: Blue.

3. Colors for 240 V Circuits:

    a. Phase A: Black.
    b. Phase B: Red.

4. Colors for 480Y/277 V Circuits:

    a. Phase A: Brown.
    b. Phase B: Orange.
    c. Phase C: Yellow.

5. Color for Neutral (Grounded Conductor): White or gray.
6. Color for Equipment Ground: Green.
7. Color for Isolated Ground: Green with two or more yellow stripes.

D. Color-Coding Raceways, Cable Trays, Junction Boxes, and Conductors for Intrinsically-Safe Circuits: Light blue. When used to identify intrinsically-safe circuits, Article 504 of NFPA 70 requires that the color light blue not be used for any other purpose.
E. Color-Coding Instructional Signs: Self-adhesive labels, including color code for grounded and ungrounded conductors.

F. Accessible Fittings for Raceways: Identify cover of junction and pull box of the following systems with wiring system legend and system voltage. System legends must be as follows:

1. "EMERGENCY POWER."
2. "POWER."
3. "UPS."

G. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.
H. Locations of Underground Lines: Underground-line warning tape for power and lighting.
I. Vaults, Manholes, Handholes, and Pull and Junction Boxes, 1000 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use vinyl wraparound labels to identify phase.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50 ft maximum intervals in straight runs, and at 25 ft maximum intervals in congested areas.
2. Identify system voltage and system or service type with black letters on orange field.

J. Accessible Raceways and Metal-Clad Cables, 1000 V or Less, for Service, Feeder, and Branch Circuits, More Than 30 A and 120 V to Ground: Identify with self-adhesive raceway labels vinyl tape applied in bands.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50 ft maximum intervals in straight runs, and at 25 ft maximum intervals in congested areas.
2. Identify system voltage and system or service type with black letters on orange field.

K. Conductors to Be Extended in Future: Attach write-on tags to conductors and list source.
L. Cover Plates: Label individual cover plates with self-adhesive labels. Place label at top of cover plate. Label cover plate with the following information, in the order listed:

1. Panelboard designation.
2. Colon or dash.
3. Branch circuit number.

M. Equipment Identification Labels:

1. Black letters on white field.
2. Indoor Equipment: Baked-enamel signs.
3. Outdoor Equipment: Laminated acrylic or melamine sign.
4. Equipment to Be Labeled:

    a. Racks, Frames, and Enclosures: Identify front and rear of each with self-adhesive labels containing equipment designation.
    b. Panelboards: Typewritten directory of circuits in location provided by panelboard manufacturer. Panelboard identification must be in the form of self-adhesive, engraved, engraved, laminated acrylic or melamine label.
    c. Enclosures and electrical cabinets.
    d. Access doors and panels for concealed electrical items.
    e. Switchboards.
    f. Transformers: Label that includes tag designation indicated on Drawings for transformer, feeder, and panelboards or equipment supplied by secondary.
    g. Enclosed switches.
    h. Enclosed circuit breakers.
    i. Enclosed controllers.
    j. Variable-speed controllers.
    k. Push-button stations.
    l. Power-transfer equipment.
    m. Contactors.
    n. Remote-controlled switches, dimmer modules, and control devices.

N. Cable Ties: General purpose, for attaching tags, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

3.3 SELECTION OF SIGNS AND HAZARD MARKINGS

A. Comply with 29 CFR 1910.145 for danger, caution, warning, and safety instruction signs.
B. Signs, labels, and tags required for personnel safety must comply with the following standards:

1. Safety Colors: NEMA Z535.1.
2. Facility Safety Signs: NEMA Z535.2.
3. Safety Symbols: NEMA Z535.3.
4. Product Safety Signs and Labels: NEMA Z535.4.
5. Safety Tags and Barricade Tapes for Temporary Hazards: NEMA Z535.5.

C. Electrical Hazard Warnings:

1. Arc-Flash Hazard Warning: Self-adhesive labels. Comply with NFPA 70E and Section 260573.19 "Arc-Flash Hazard Analysis" requirements for arc-flash hazard warning labels.
2. Multiple Power Sources Warning Legend: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
3. OSHA Workspace Clearance Warning Legend: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 3 FEET MINIMUM."

D. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Baked-enamel warning signs.

1. Apply to exterior of door, cover, or other access.
2. For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:

    a. Power-transfer switches.
    b. Controls with external control power connections.

E. Operating Instruction Signs: Self-adhesive labels.

3.4 SELECTION OF IDENTIFICATION PRODUCTS FOR COMMUNICATIONS, CONTROL, AUXILIARY, AND LIFE SAFETY SYSTEMS

A. Comply with Section 270528 "Pathways for Communications Systems" and Section 271100 "Communications Equipment Room Fittings."

3.5 INSTALLATION

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. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes typical for electrical equipment environments specified in Section 260011 "Facility Performance Requirements for Electrical."
C. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).
D. Fasteners for Labels and Signs: Self-tapping, stainless steel screws or stainless steel machine screws with nuts and flat and lock washers.
E. 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.

F. Install identifying devices before installing acoustical ceilings and similar concealment.
G. Verify identity of item before installing identification products.
H. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.
I. Apply identification devices to surfaces that require finish after completing finish work.
J. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.
K. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from floor.
L. Vinyl Wraparound Labels:

    1. Secure tight to surface of raceway or cable at location with high visibility and accessibility.
    2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to location and substrate.

M. Snap-Around Labels: Secure tight to surface at location with high visibility and accessibility.
N. Self-Adhesive Wraparound Labels: Secure tight to surface at location with high visibility and accessibility.
O. Snap-Around Color-Coding Bands: Secure tight to surface at location with high visibility and accessibility.
P. Heat-Shrink, Preprinted Tubes: Secure tight to surface at location with high visibility and accessibility.
Q. Marker Tapes: Secure tight to surface at location with high visibility and accessibility.
R. Self-Adhesive Vinyl Tape: Secure tight to surface at location with high visibility and accessibility.

1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for minimum distance of 6 inch where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.

S. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.
T. Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's instructions.
U. Underground Line Warning Tape:

1. During backfilling of trenches, install continuous underground-line warning tape not less than 12 inch directly above cables or raceways buried 18 inch or more below grade. Use multiple tapes where width of multiple lines installed in common trench or concrete envelope exceeds 16 inch overall.
2. Limit use of underground-line warning tape to direct-buried cables.
3. Install underground-line warning tape for direct-buried cables and cables in raceways.

V. Concrete Cable Route Markers: As indicated on Drawings
W. Metal Tags:

1. Place in location with high visibility and accessibility.
2. Secure using general-purpose UV-stabilized plenum-rated cable ties.

X. Nonmetallic Preprinted Tags:

1. Place in location with high visibility and accessibility.
2. Secure using general-purpose UV-stabilized plenum-rated cable ties.

Y. Write-on Tags:

1. Place in location with high visibility and accessibility.
2. Secure using general-purpose UV-stabilized plenum-rated cable ties.

Z. Baked-Enamel Signs: Attach signs that are not self-adhesive type with mechanical fasteners appropriate to location and substrate.
AA. Metal-Backed Butyrate Signs: Attach signs that are not self-adhesive type with mechanical fasteners appropriate to location and substrate.
BB. Laminated Acrylic or Melamine Plastic Signs: Attach signs that are not self-adhesive type with mechanical fasteners appropriate to location and substrate.

END OF SECTION

SECTION 26 09 23
LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Time switches.
2. Photoelectric switches.
3. Indoor occupancy and vacancy sensors.
4. Switchbox-mounted occupancy sensors.
5. Digital timer light switch.
6. High-bay occupancy sensors.
7. Lighting contactors.
8. Emergency shunt relay.

B. Related Requirements:

1. Section 262726 "Wiring Devices" for wall-box dimmers, non-networkable wall-switch occupancy sensors, and manual light switches.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Shop Drawings:

1. Show installation details for the following:

a. Occupancy sensors.
b. Vacancy sensors.

2. Interconnection diagrams showing field-installed wiring.
3. Include diagrams for power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

A. Operation and Maintenance Data: For each type of lighting control device to include in operation and maintenance manuals.
B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.

2. Program Software Backup: On manufacturer's website. Provide names, versions, and website addresses for locations of installed software.
3. Device address list.
4. Printout of software application and graphic screens.

1.4 WARRANTY

A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace lighting control devices that fail(s) in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

   a. Faulty operation of lighting control software.
   b. Faulty operation of lighting control devices.

2. Warranty Period: Two year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TIME CLOCKS

A. Manufacturers: Subject to compliance with requirements, provide products by Intermatic.
B. Electronic Time Clocks: Electronic, solid-state programmable units with alphanumeric display; complying with UL 917.

1. Contact Rating: 30-A inductive or resistive, 240-volt ac.
2. Program: Two on-off set points on a 24-hour schedule, allowing different set points for each day of the week and an annual holiday schedule that overrides the weekly operation on holidays.
3. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program on selected channels.
4. Astronomic Time: All channels.
5. Battery backup is required for schedules and time clock.

2.2 ELECTROMECHANICAL DIAL-TIME SWITCHES

A. Description: Solid state, with dry contacts rated for 1000 W incandescent or 1800 VA inductive, to operate connected load, complying with UL 773, and compatible with LED lamps.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range.
3. Time Delay: Thirty-second minimum, to prevent false operation.
4. Lightning Arrester: Air-gap type.
5. Mounting: Twist lock complying with NEMA C136.10, with base.
6. Failure Mode: Luminaire stays ON.

B. Description: Solid state; one set of NO dry contacts rated for 24 V dc at 1 A, to operate connected load, complying with UL 773, and compatible with lighting control panelboard.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range.
3. Time Delay: Thirty-second minimum, to prevent false operation.
4. Mounting: 1 /2-inch threaded male conduit.
5. Failure Mode: Luminaire stays ON.
6. Power Pack: Digital controller capable of accepting three RJ45 inputs with two outputs rated for 20-A incandescent or LED load at 120- and 277-V ac, for 16-A LED at 120- and 277-V ac. Sensor has 24-V dc, Class 2 power source, as defined by NFPA 70.

   a. With integral current monitoring.
   b. Compatible with digital addressable lighting interface.
   c. Plenum rated.

2.3 INDOOR OCCUPANCY AND VACANCY SENSORS

A. General Requirements for Sensors:

1. Ceiling-mounted, solid-state indoor occupancy and vacancy sensors.
2. Passive infrared, Ultrasonic or Dual technology.
3. Integrated or Separate power pack.
4. Hardwired or Wireless connection to switch; and BAS and lighting control system.
5. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
6. Operation:

   a. Occupancy Sensor: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time, delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
   b. Vacancy Sensor: Unless otherwise indicated, lights are manually turned on and sensor turns lights off when the room is unoccupied;

with a time, delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.

c. Combination Sensor: Unless otherwise indicated, sensor shall be programmed to turn lights on when coverage area is occupied and turn them off when unoccupied, or to turn off lights that have been manually turned on; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.

7. Sensor Output: Sensor is powered from the power pack.
8. Power: Line voltage.
9. Power Pack: Dry contacts rated for 20-A LED load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
10. Mounting:

    a. Sensor: Suitable for mounting in any position on a standard outlet box.
    b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
    c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

11. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
12. Bypass Switch: Override the "on" function in case of sensor failure.
13. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; turn lights off when selected lighting level is present.

B. PIR Type: Ceiling mounted; detect occupants in coverage area by their heat and movement.

1. Detector Sensitivity: Detect occurrences of 6-inch-minimum movement of any portion of a human body that presents a target of not less than 36 sq. in.
2. Detection Coverage (Room, Ceiling Mounted): Detect occupancy anywhere in a circular area of 1000 sq. ft. when mounted on a 96-inch-high ceiling.
3. Detection Coverage (Corridor, Ceiling Mounted): Detect occupancy within 90 feet when mounted on a 10-foot-high ceiling.

C. Ultrasonic Type: Ceiling mounted; detect occupants in coverage area through pattern changes of reflected ultrasonic energy.

1. Detector Sensitivity: Detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
2. Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 600 sq. ft. when mounted on a 96-inch-high ceiling.

3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch-high ceiling.
4. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. when mounted on a 96-inch-high ceiling.
5. Detection Coverage (Corridor): Detect occupancy anywhere within 90 feet when mounted on a 10-foot-high ceiling in a corridor not wider than 14 feet.
6. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 1000 square feet when mounted84 inches above finished floor.

D. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.

1. Sensitivity Adjustment: Separate for each sensing technology.
2. Detector Sensitivity: Detect occurrences of 6-inch-minimum movement of any portion of a human body that presents a target of not less than 36 sq. in., and detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch-high ceiling.
4. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 1000 square feet when mounted 48 inches above finished floor.

2.4 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

A. General Requirements for Sensors: Automatic-wall-switch occupancy sensor with manual on-off switch, suitable for mounting in a single gang switchbox using hardwired connection.

1. Listed and labeled in accordance with NFPA 70, by a qualified testing agency and marked for intended location and application.
2. Occupancy Sensor Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn lights off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
3. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F.
4. Switch Rating: Not less than 800 VA LED load at 120 V, 1200 VA LED load at 277 V, and 800 W incandescent.

B. Wall-Switch Sensor:

1. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 900 sq. ft.
2. Sensing Technology: PIR.
3. Switch Type: SP, field-selectable automatic "on," or manual "on," automatic "off."
4. Capable of controlling load in three-way application.
5. Voltage: Dual voltage - 120 and 277 V.
6. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
7. Concealed, "off" time-delay selector at 30 seconds and 5, 10, and 20 minutes.
8. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.
9. Color: White.
10. Faceplate: Color matched to switch.

2.5 OUTDOOR MOTION SENSORS

A. Description: Solid-state outdoor motion sensors.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Dual-technology (PIR and ultrasonic) type, weatherproof. Detect occurrences of 6-inch-minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. Comply with UL 773A.
3. Switch Rating:

    a. Luminaire-Mounted Sensor: 1000-W incandescent, 500 VA fluorescent/LED.
    b. Separately Mounted Sensor: Dry contacts rated for 20-A LED load at 120- and 277-V(ac), for 13-A tungsten at 120-V(ac), and for 1 hp at 120-V(ac). Sensor has 24-V(dc), 150-mA, Class 2 power source. As defined by NFPA 70.

4. Switch Type: SP, field-selectable automatic "on," or manual "on," automatic "off." With bypass switch to override the "on" function in case of sensor failure.
5. Voltage: Dual voltage, 120- and 277-V type.
6. Detector Coverage:

    a. Standard Range: 210-degree field of view, with a minimum coverage area of 900 sq. ft.
    b. Long Range: 180-degree field of view and 110 ft. detection range.

7. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc. The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.

8. Concealed, "off" time-delay selector at 30 seconds and 5, 10, and 20 minutes.
9. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and help eliminate false "off" switching.
10. Operating Ambient Conditions: Suitable for operation in ambient temperatures ranging from minus 40 to plus 130 deg F, rated as "raintight" in accordance with UL 773A.

2.6 LIGHTING CONTACTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Square D
2. Siemens
3. General Electric

B. Description: Electrically operated and electrically held, combination-type lighting contactors with fusible switch, complying with NEMA ICS 2 and UL 508.

1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less THD of normal load current).
2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
3. Enclosure: Comply with NEMA 250.
4. Provide with control power transformer, HOA switch and red pilot devices as indicated on Drawings, matching the NEMA type specified for the enclosure.

2.7 EMERGENCY SHUNT RELAY

A. Description: NC, electrically held relay, arranged for wiring in parallel with manual or automatic switching contacts; complying with UL 924.

1. Coil Rating: 120 V.

2.8 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine lighting control devices before installation. Reject lighting control devices that are wet, moisture damaged, or mold damaged.
B. Examine walls and ceilings for suitable conditions where lighting control devices will be installed.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SENSOR INSTALLATION

A. Comply with NECA 1.
B. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
C. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's instructions.

3.3 CONTRACTOR INSTALLATION

A. Comply with NECA 1.
B. 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.

3.4 EMERGENCY (LIFE SAFETY) CIRCUITS

A. Provide UL 924 listed lighting control unit where emergency (Life Safety) circuits are controlled.

3.5 WIRING INSTALLATION

A. Comply with NECA 1.
B. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch.
C. Wiring within Enclosures: Separate power-limited and nonpower-limited conductors in accordance with conductor manufacturer's instructions.
D. Size conductors in accordance with lighting control device manufacturer's instructions unless otherwise indicated.
E. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, device, and outlet boxes; terminal cabinets; and equipment enclosures.

3.6 IDENTIFICATION

A. Identify components and power and control wiring in accordance with Section 260553 "Identification for Electrical Systems.

    1. Identify controlled circuits in lighting contactors.
    2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.

B. Label time switches and contactors with a unique designation.

3.7 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

    1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.

2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Lighting control devices will be considered defective if they do not pass tests and inspections.
D. Prepare test and inspection reports.

3.8 SOFTWARE SERVICE AGREEMENT

A. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for two years.
B. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.

1. Upgrade Notice: At least 30 days to allow Owner to schedule and access the system and to upgrade computer equipment if necessary.

3.9 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION

SECTION 26 24 16
PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUBMITTALS

A. Product Data: Submit for each type of panelboard, overcurrent protective device, transient voltage suppression device and accessory provided.
B. Overcurrent Protective Device Coordination Study: Submit for review along with product data. Rever to Division 26, “Overcurrent Protective Device Coordination Study.”

1.3 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

1.4 SELECTIVE COORDINATION

A. The standby generator distribution system shall be selectively coordinated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    1. Panelboards and Overcurrent Protective Devices:

        a. Square D
        b. General Electric
        c. Siemens

2. Transient Voltage Suppression Panelboards:

    a. Square D
    b. General Electric
    c. Siemens

B. The basis of design manufacturer for this project is Square D to establish the minimum standards for quality and performance. Other manufacturers are acceptable only if:

1. The equipment is from one of the manufacturers listed above.
2. The equipment quality and performance is equal to the Basis of Design.
3. The equipment dimensions are equal to or smaller than the Basis of Design.

2.2 FABRICATION

A. Enclosures:

1. Rated for environmental conditions at installed location.

    a. Outdoor, Wet or Damp Locations: NEMA 250, Type 3R.
    b. Kitchen Areas: NEMA 250, Type 4X, stainless steel.

2. Doors: Door-within-door type.
3. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.
4. Directory Card: Provide transparent protective cover, mounted in metal frame, inside panelboard door.

B. Phase and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.

C. Conductor Connectors: Suitable for use with conductor material.

1. Main and Neutral Lugs: Compression type.
2. Ground Lugs and Bus Configured Terminators: Compression type.
3. Feed-Through Lugs: Compression type suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

D. Service Equipment Label: UL labeled for use as service equipment for panelboards with main service disconnect switches.

E. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.

2.3 SHORT-CIRCUIT RATING

A. Fully rated to interrupt the symmetrical short-circuit current available at the terminals.

2.4 DISTRIBUTION PANELBOARDS

A. Branch Overcurrent Protective Devices:

1. Circuit-Breaker Frame Sizes 125 Ampere and Smaller: Bolt-on circuit breakers.
2. Circuit-Breaker Frame Sizes Larger Than 125 Ampere: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

B. Doors: Door-within-door type secured with vault-type latch with tumbler lock; keyed alike.

2.5 PANELBOARDS

A. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
B. Doors: Door-within-door type, concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.6 TRANSIENT VOLTAGE SUPPRESSION PANELBOARDS

A. Branch Overcurrent Protective Devices: Bolt-on circuit breakers.
B. Doors: Door-within-door type, concealed hinges; secured with vault-type latch with tumbler lock; keyed alike.
C. Transient Voltage Suppression Device: IEEE C62.41, integrally mounted, plug-in-style, solid-state, parallel-connected, sinewave tracking suppression and filtering modules.

1. Minimum Single-Impulse Current Ratings:

a. Line-to-Neutral: 100,000 ampere.
b. Line-to-Ground: 100,000 ampere.
c. Neutral-to-Ground: 50,000 ampere.

2. Protection modes shall be as follows:

a. Line-to-neutral.

b. Line-to-ground.
c. Neutral-to-ground.

3. EMI/RFI Noise Attenuation Using 50-ohm Insertion Loss Test: 55 dB at 100 kHz.
4. Maximum Category C Combination Wave Clamping Voltage: 600 volt, line-to-neutral and line-to-ground on 120/208-volt systems.
5. Maximum UL 1449 Clamping Levels:

   a. 400 volt, line-to-neutral and line-to-ground on 120/208 volt.
   b. 800 volt, line-to-neutral and line-to-ground on 277/480-volt systems.

6. Withstand Capabilities: 3000 Category C surges with less than five percent change in clamping voltage.

2.7 OVERCURRENT PROTECTIVE DEVICES

A. Molded-case circuit breaker with interrupting capacity to meet available fault currents. Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250A and larger.
B. Circuit Breakers Rated 800 Amps or More: Provide electronic trip unit with adjustable Long-Time, Short-Time and Instantaneous trip functions. Provide ground fault protection (G) where called out on the one-line drawing.
C. Circuit Breakers Rated 1200 Amps or More: Provide trip unit with a maintenance mode switch with LED indicator lights that overrides the trip settings in order to minimize the arc flash hazard during maintenance.

2.8 SPACE FOR FUTURE CIRCUIT BREAKRS OR FUSED SWITCHES

A. Provide as indicated on the drawings. Spaces shall be completely equipped for the future addition of a circuit breaker or fused switch, including all mounting hardware and buss connections. Unless otherwise noted, spaces shall be sized to accommodate the following future circuit breaker or fused switch:

Panel Rating	Minimum Space Ampacity
100 Amperes	70 Amperes
225 Amperes	125 Amperes
400 Amperes	225 Amperes
600 Amperes	400 Amperes
800 Amperes	600 Amperes
1200 Amperes	800 Amperes

2.9 INSTRUMENTATION (DISTRIBUTION PANELBOARDS)

A. Instrument Transformers: NEMA EI 21.1, IEEE C57.13, and the following:

1. Potential Transformers: Secondary voltage rating of 120 volt and NEMA accuracy class of 0.3 with burdens of W, X, and Y.
2. Current Transformers: Ratios shall be as indicated with accuracy class and burden suitable for connected relays, meters, and instruments.
3. Control-Power Transformers: Dry type, mounted in separate compartments for units larger than 3kV.
4. Current Transformers for Neutral and Ground-Fault Current Sensing: Connect secondaries to ground overcurrent relays to provide selective tripping of main and tie circuit breaker. Coordinate with feeder circuit-breaker ground-fault protection.

B. Main Bus:

1. Provide digital power monitor which displays:

   a. Phase-to-phase and phase-to-neutral voltage on all three phases.
   b. Current on all three phases and the neutral.
   c. Power factor kW and kVA.

C. Each Feeder:

1. Provide digital power monitor which displays:

   a. Phase-to-phase and phase-to-neutral voltage on all three phases.
   b. Current on all three phases and the neutral.
   c. Power factor kW and kVA.
   d. KWH, revenue-grade, nonresetable. KWH meter to have pulsed output, same as utility meter.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Mount top of trim 74 inches above finished floor, unless otherwise indicated.
B. Mount plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.
C. Install overcurrent protective devices and controllers. Set field-adjustable switches and circuit-breaker trip ranges.
D. Install filler plates in unused spaces.
E. Stub four one-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four one-inch empty conduits into raised floor space or below slab not on grade.

F. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

3.2 DIRECTORY

A. Provide a directory to indicate installed circuit loads. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

3.3 IDENTIFICATION DEVICES

A. Label each panelboard with an engraved laminated plastic nameplate as specified in Division 26, "Identification."

3.4 ACCEPTANCE TESTING

A. After all wiring is complete, all feeder and branch circuit terminations shall be checked with a torque wrench. Torque levels shall be in accordance with NETA Standard ATS unless otherwise specified by the manufacturer. A test report which gives the following information for each panelboard shall be submitted to the Engineer two weeks prior to final inspection:

1. Size and insulation type of the phase, neutral and ground conductors.
2. Phase-to-phase and phase-to-neutral operating load voltage.
3. Operating load current (each phase, neutral and ground).

B. Phase-to-phase and phase-to-neutral conductor insulation resistance. Test shall be made with a DC "Megger" (500-volt minimum) type tester. If tests indicate faulty insulation (less than 8 megohms), the conductors shall be replaced and retested.

END OF SECTION

SECTION 26 27 26
WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUBMITTALS

A. Product Data: Submit for each type of product provided.

PART 2 - PRODUCTS

2.1 GENERAL

A. Devices with preconnectorized pigtails are not acceptable.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Specification and Hospital Grade

    a. Arrow Hart
    b. Hubbell
    c. Leviton
    d. Pass & Seymour

2. Industrial Extra Duty Grade and Hospital Extra Duty Grade

    a. Hubbell. No Substitutions.

2.3 SPECIFICATION-GRADE DEVICES

1. Convenience and Dedicated Receptacles, 125-volt, 20 ampere, NEMA 5-20R. Subject to compliance with requirements, provide one of the following products:

    a. Arrow Hart; 5352 (duplex)
    b. Hubbell; 5352 (duplex)
    c. Leviton; 5352 (duplex)
    d. Pass & Seymour; 5352 (duplex)

2. Isolated-Ground, Duplex Convenience Receptacles, 125-volt, 20 ampere, NEMA 5-20R. Subject to compliance with requirements, provide one of the following products:

    a. Hubbell; CR5253IG
    b. Leviton; 5362-IG
    c. Pass & Seymour; IG6300

3. Tamper-Resistant Convenience Receptacles, 125-volt, 20 ampere, NEMA 5-20R. Subject to compliance with NEMA WD6 and UL 498, provide one of the following products:

    a. Arrow Hart; TR8300
    b. Hubbell; BR20TR series
    c. Leviton; TBR20
    d. Pass & Seymour; 63H

4. Surge Suppression Device (SPD) Receptacles, 125-volt, 20 ampere, NEMA 5-20R. Subject to compliance with requirements, provide one of the following products:

    a. Pass & Seymour; IG 6362-050
    b. Hubbell; IG5360SA

B. GFCI Receptacles:

1. General Description: Straight blade, non-feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.
2. Duplex GFCI Convenience Receptacles, 125-volt, 20 ampere: Subject to compliance with requirements, provide one of the following products:

    a. Arrow Hart; SGF20
    b. Hubbell; GFRST20 series
    c. Pass & Seymour; 2097TRA
    d. Leviton; GFNT2

C. USB Receptacles:

1. General Description: Straight blade. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL1310, Type A, Class 2.0 with LED power indicator light.
2. Duplex USB Convenience Receptacles, 125-volt, 20 ampere; USB 5V DC 3.8 Ampere: Subject to compliance with requirements, provide one of the following products:

    a. Hubbell; USB20X2.

2.4 INDUSTRIAL EXTRA-DUTY GRADE DEVICES

A. Straight Blade Receptacles:

1. Convenience or Dedicated Receptacles, 125-volt, 20 ampere, NEMA 5-20R with one piece brass mounting strap. Subject to compliance with requirements, provide one of the following products:

    a. Hubbell; HBL5362 (duplex).

2. Isolated-Ground, Duplex Convenience Receptacles, 125-volt, 20 ampere, NEMA 5-20R, with brass mounting strap. Subject to compliance with requirements, provide one of the following products:

    a. Hubbell; IG5362 (duplex).

3. Tamper-Resistant Convenience Receptacles, 125-volt, 20 ampere, NEMA 5-50R, with brass mounting strap. Subject to compliance with requirements, provide one of the following products:

    a. Hubbell; HBL5362TR (duplex).

4. Surge Suppression Device (SPD) Receptacles, 120-volt, 20 ampere, NEMA 5-20R with end of life light and audio alarm. Subject to compliance with requirements, provide one of the following products:

    a. Hubbell; HBL5362SA.

B. GFCI Receptacles:

1. General Description: Straight blade, non-feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped and end of life indicator.
2. Duplex GFCI Convenience Receptacles, 125-volt, 20 ampere: Subject to compliance with requirements, provide one of the following products:

    a. Hubbell; GFR5362SG.

2.5 TOGGLE SWITCHES

A. Comply with NEMA WD 1 and UL 20.
B. Switches, 120/277 Volt, 20 Amperes: Subject to compliance with requirements, provide one of the following products:

    a. Cooper; 2221 (single pole), 2222 (two pole), 2223 (three way), 2224 (four way)
    b. Hubbell; 1221 (single pole), 1222 (two pole), 1223 (three way), 1224 (four way)
    c. Leviton; 1221-2 (single pole), 1222-2 (two pole), 1223-2 (three way), 1224-2 (four way)
    d. Pass & Seymour; 20AC1 (single pole), 20AC2 (two pole), 20AC3 (three way), 20AC4 (four way)

C. Pilot Light Switches, 20 Ampere: Subject to compliance with requirements, provide one of the following products:

    a. Cooper; 2221PL for 120 Volt and 277 Volt
    b. Hubbell; HPL1221PL for 120 Volt and 277 Volt
    c. Leviton; 1221-PLR for 120 Volt, 1221-7PLR for 277 Volt
    d. Pass & Seymour; PS20AC1-PLR for 120 Volt

D. Key-Operated Switches, 120/277 Volt, 20 Ampere: Subject to compliance with requirements, provide one of the following products:

    a. Cooper; 2221L
    b. Hubbell; HBL1221L
    c. Leviton; 1221-2L
    d. Pass & Seymour; PS20AC1-L

2.6 WEATHERPROOF RECEPTACLES

A. Provide 20A duplex GFCI receptacle with metallic cover that is UL Extra-Duty While-In-Use weatherproof whether or not the attachment plug is inserted.

    a. Intermatic WP 1010MC cover.
    b. Hubbell WP26E

2.7 CORD AND PLUG SETS

A. Retain this article if cord and plug sets for equipment are furnished by Owner or are specified in other Sections. Coordinate with other Sections and with Part 3.

B. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
C. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.
D. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.8 OCCUPANCY SENSORS

A. Wall Switch Sensor Light Switch, Dual Technology:

1. Description: Switchbox-mounted, combination lighting-control sensor and conventional switch lighting-control unit using dual (ultrasonic and passive infrared) technology.
2. Standards: Comply with UL 20.
3. Rated 960 W at 120 V ac for tungsten lighting, 10 A at 120 V ac or 10 A at 277 V ac for fluorescent or LED lighting, and 1/4 hp at 120 V ac.
4. Adjustable time delay of 10 minutes.
5. Connections: RJ-45 communications outlet.

2.9 DIMMERS

A. Wall-Box Dimmers:

1. Description: Modular, full-wave, solid-state dimmer switch with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.
2. Control: Continuously adjustable slider; with single-pole or three-way switching.
3. Standards: Comply with UL 1472.
4. LED Lamp Dimmer Switches: Modular; compatible with LED lamps; trim potentiometer to adjust low-end dimming; capable of consistent dimming with low end not greater than 10 percent of full brightness.
5. Confirm compatibility with the LED luminaire driver for the application.

2.10 DEVICE PLATES

A. Finished Areas-Surface or Flush-Mounted: 302/304 stainless steel.

a. Hubbell; SS Series
b. Pass & Seymour

B. Unfinished Areas-Surface-Mounted Devices: 4/S raised steel.

2.11 FINISHES

A. Color:

1. Wire device catalog numbers in section do not designate the device color.
2. Wiring Devices Connected to Normal Power System: White.
3. Wiring Devices Connected to Generator: Red.
4. Isolated-Ground Receptacles: Orange.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.
B. Coordination with Other Trades:

1. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
2. Install device boxes in brick or block walls so that the coverplate does not cross a joint unless the joint is troweled flush with the face of the wall.
3. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors: The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300 without pigtails.
D. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than six inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.

7. When conductors larger than No. 12 AWG are installed on 15- or 20-ampere circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation: Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.
F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
G. Arrangement of Devices: Unless otherwise indicated mount flush with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.
H. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 IDENTIFICATION

A. Comply with Division 26 Section "Identification for Electrical Systems."
B. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.
C. Computer Receptacles: Identify "Computer" in 3/16 inches high letter on the top of the plate. Label with panel and circuit number at the bottom of the plate.
D. Receptacles Installed in a Multi-System Wall Box: Labeled with panel and circuit number utilizing a computer-generated printed self-adhesive label.

3.3 FIELD QUALITY CONTROL

A. Test Instruments: Use instruments that comply with UL 1436.
B. Test Instrument for Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
C. Perform the following tests and inspections:

1. Test Instrument for Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

D. Tests for Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault-current path, defective devices, or similar problems. Correct circuit conditions remove malfunctioning units and replace with new ones, and retest as specified above.

E. See Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.
F. Wiring device will be considered defective if it does not pass tests and inspections.
G. Prepare test and inspection reports.

END OF SECTION

SECTION 26 28 16
ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUBMITTALS

A. Product Data: Submit for each type of enclosed switch, circuit breaker and accessory being provided.

1.3 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with the requirements, provide products by one of the following:

1. Square D
2. General Electric
3. Siemens

B. The basis of design for this project is Square D to establish the minimum standards for quality and performance. Other manufacturers are acceptable only if:

1. The equipment is from one of the manufacturers listed above.
2. The equipment quality and performance is equal to the basis of design.

3. The equipment dimensions are equal to or smaller than the basis of design.

2.2 FUSIBLE AND NONFUSIBLE SWITCHES

A. Fusible Switch-600A and Smaller: NEMA KS 1, Type HD with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

B. Nonfusible Switch-600A and Smaller: NEMA KS 1, Type HD, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

2.3 MOLDED-CASE CIRCUIT BREAKERS AND SWITCHES

A. Molded-Case Circuit Breaker: NEMA AB 1 with interrupting capacity to meet available fault currents. Provide with the following features and accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical style with compression lug kits suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.

B. Molded-Case Switches: Molded-case circuit breaker with fixed, high-set instantaneous trip only, and short-circuit withstand rating equal to equivalent breaker frame size interrupting rating. Provide with the following features and accessories:

1. Lugs: Mechanical style with compression lug kits suitable for number, size, trip ratings, and material of conductors.
2. Application Listing: Type HACR for heating, air-conditioning, and refrigerating equipment.

2.4 ENCLOSURES

A. Rated for environmental conditions at installed locations.

1. Outdoor, wet or damp locations; NEMA 250, Type 3R.
2. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
3. Other wet or damp indoor locations; NEMA 250, Type 4.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Control Equipment Mounted to Walls: Mount adjacent units at uniform height. Bolt units to wall or mount on lightweight structural-steel channels bolted to wall. Provide freestanding racks complying with Division 26, Section 260529, "Hangers and Supports," for controllers not located on walls.

B. Floor-Mounted Control Equipment: Anchor to concrete base.

C. Install fuses in each fusible switch.

3.2 IDENTIFICATION DEVICES

A. Label each switch and circuit breaker on engraved laminated plastic as specified in Division 26, Section 260553, "Identification."

3.3 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges.

END OF SECTION

SECTION 26 50 00
LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Luminaires.
2. Luminaire fittings.
3. Electric-discharge lamp control equipment.
4. Lamps.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" specifies additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260011 "Facility Performance Requirements for Electrical" specifies seismic-load, wind-load, acoustical, and other field conditions applicable to Work specified in this Section.
3. Section 260519 "Low-Voltage Electrical Power Conductors and Cables" specifies wiring connections installed by this Section.
4. Section 260529 "Hangers and Supports for Electrical Systems" specifies channel and angle supports installed by this Section.
5. Section 260553 "Identification for Electrical Systems" specifies electrical equipment labels and warning signs installed by this Section.
6. Section 260923 "Lighting Control Devices" specifies automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors installed by this Section.
7. Section 260936 "Modular Dimming Controls" specifies architectural dimming systems and for fluorescent dimming controls with dimming installed by this Section.
8. Section 260943.16 "Addressable Luminaire Lighting Controls" and Section 260943.23 "Relay-Based Lighting Controls" specify manual or programmable control systems with low-voltage control wiring or data communication circuits installed by this Section.

1.2 DEFINITIONS

A. BUG Rating: Backlight, uplight, and glare rating for light pollution from exterior luminaires.
B. CMH: Ceramic metal halide.
C. Correlated Color Temperature (CCT): The absolute temperature (in kelvins) of a blackbody whose chromaticity (color quality) most nearly resembles that of the light source.
D. Color Rendering Index (CRI): The measure of the degree of color shift objects undergo when illuminated by the light source as compared with the color of those same objects when illuminated by a reference light source. The lower the CRI of a light source, the more difficult it is to identify colors and stripes on electronic components and wiring.
E. HPS: High-pressure sodium.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.
3. Include physical description and dimensions of luminaires.
4. Include emergency lighting units, including batteries and chargers.
5. Include life, output (lumens, CCT, and CRI), and energy-efficiency data.
6. Photometric data and adjustment factors based on laboratory tests, complying with IES "Lighting Measurements Testing and Calculation Guides" for each luminaire type. The adjustment factors shall be for lamps and accessories identical to those indicated for the luminaire as applied in this Project IES LM-79 and IES LM-80.

    a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

1.4 COORDINATION

A. Coordinate layout and installation of luminaires and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.
B. Provide drivers that match the service voltage being provided to the fixture.

C. Provide drivers as required to accommodate the fixture switching/dimming scheme shown on the drawings.

1.5 EXTERIOR AND DAMP LOCATION FIXTURES

A. Fixtures installed in the following locations shall be UL listed and labeled for wet locations:

1. Exterior locations
2. Interior wet locations
3. Interior damp locations

1.6 ACCESSORIES

A. General: Provide all required hardware and accessories for a complete installation.
B. Trims: The Contractor shall coordinate with the architectural drawings and provide the appropriate trim for each recessed fixture.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.9 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
B. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Refer to Luminaire Schedule on the drawings.

2.2 LUMINAIRE REQUIREMENTS

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. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

    1. Label shall include the following lamp characteristics:

        b. "USE ONLY" and include specific lamp type.
        c. Lamp diameter, shape, size, wattage, and coating.
        d. CCT and CRI.

C. Recessed luminaires shall comply with NEMA LE 4.
D. Standards:

    1. RoHS compliant.
    2. UL Listing: Listed for damp location.

2.3 MATERIALS

A. Metal Parts:

    1. Free of burrs and sharp corners and edges.
    2. Sheet metal components shall be steel unless otherwise indicated.
    3. Form and support to prevent warping and sagging.

B. Steel:

    1. ASTM A 36/A 36M for carbon structural steel.
    2. ASTM A 568/A 568M for sheet steel.

C. Stainless Steel:

    1. Manufacturer's standard type, ASTM A 240/240 M.
    2. Manufacturer's standard grade.

D. Galvanized Steel: ASTM A 653/A 653M.
E. Aluminum: ASTM B 209.

2.4 METAL FINISHES

A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved samples and if they can be and are assembled or installed to minimize contrast.

2.5 LUMINAIRE SUPPORT

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.
B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.
C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage.
D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

2.6 DIFFUSERS:

A. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and/or UV radiation.

    1. Lens Thickness: 0.125 inch minimum.
    2. UV stabilized.

2.7 LINEAR LUMINAIRES:

A. LED linear luminaires are shown actual length on the drawings based on increments offered by manufacturer. Driver quantity to be based on manufacturer’s recommendation per fixture length.

2.8 GENERAL REQUIREMENTS FOR LEDS

A. Correlated color temperature (CCT), as indicated on the Luminaire Schedule on the drawings, for phosphor-coated white LEDs must have one of the following designated CCT's and fall within the following binning standards:

1. 2700K defined as 2725 +/- 145K
2. 3000K defined as 3045 +/- 175K
3. 3500K defined as 3465 +/- 245K
4. 4000K defined as 3985 +/- 275K
5. 5000K defined as 5028 +/- 283K
6. 6500K defined as 6530 +/- 510K

B. Color spatial uniformity shall be limited to variations in chromaticity for different directions (i.e., changes in viewing angle).
C. Color maintenance shall be limited to a maximum change in chromaticity of 0.007 over the lifetime of the product.
D. Color Rendering Index:

1. Color rendering index to be determined using ANSI C78.377-2008 and applicable IESNA standards.
2. Laboratory tests must be produced using specific module(s)/array(s) and driver combination that will be used in production.
3. Manufacturers must provide a test report from a laboratory accredited by NVLAP or one of its MRA signatories.

E. Lumen Depreciation:

1. Lumen depreciation to be measured using IESNA LM-80-08 standard for IES approved method of measuring lumen maintenance of LED light sources.
2. Phosphor coated white LED module(s)/array(s) shall deliver at least 70% of initial lumens for a minimum of 50,000 hours when installed in position and operated at 100% output and the maximum specified operating temperature.
3. Colored LED module(s)/array(s) shall deliver at least 50% of initial lumens for a minimum of 35,000 hours when installed in position and operated at 100% output and the maximum specified operating temperature.

F. Luminaire Efficacy:

1. Luminaire efficiency shall be measured using IESNA LM-79-08 standard for electrical and photometric measurements of solid-state lighting products.
2. Manufacturer shall provide published luminaire efficacy, which is defined as luminaire light output divided by luminaire input power measured in a

25 degree Celsius environment. Efficacy shall include driver, thermal, optical, and luminaire losses.

G. Thermal Management:

1. Solid-state luminaire shall not exceed LED manufacturer's maximum junction temperature requirements when operated in position at luminaire manufacturer's maximum ambient operating temperature and 100% light output.
2. Solid-state luminaire shall be thermally protected using one or more of the following thermal management techniques:

   a. Metal Core Board
   b. Gap Pad
   c. Internal Monitoring Firmware

3. Solid-state luminaire housing shall be designed to transfer heat from the LED board to the outside environment.

2.9 LED DRIVERS:

A. Driver shall have a power factor of 0.90 or greater for primary application.
B. Driver input current shall have Total Harmonic Distortion (THD) of less than 20%.
C. Driver output operating frequency to be equal to or greater than 120 Hz.
D. Driver shall operate with sustained input variations of +/- 10% (voltage and frequency) with no damage to the driver.
E. Driver shall tolerate sustained open circuit and short circuit output conditions without damage and without need for external fuses or trip devices.
F. Driver output shall be regulated to +/- 5% across published load range.
G. Driver shall have a Class A sound rating.
H. Driver output shall have current limiting protection.
I. Driver shall operate LEDs at constant and regulated current levels. LEDs shall not be overdriven beyond the diode manufacturer's specified nominal voltage and current.

2.10 LED LUMINAIRES

A. All hardwired connections to solid-state luminaires shall be reverse polarity protected and provide high-voltage protection in the event connections are reversed.
B. Solid-state lighting installations shall be UL listed as a low voltage lighting system, including, but not limited to: luminaire, driver, controller, keypad and wiring.

PART 2 - EXECUTION

2.11 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

2.12 INSTALLATION

A. Comply with NECA 1.
B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
C. Install lamps in each luminaire.
D. Supports:

    1. Sized and rated for luminaire weight.
    2. Able to maintain luminaire position after cleaning and relamping.
    3. Provide support for luminaire without causing deflection of ceiling or wall.
    4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

E. Flush-Mounted Luminaires:

    1. Secured to outlet box.

2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
3. Trim ring flush with finished surface.

F. Wall-Mounted Luminaires:

1. Attached to structural members in walls or attached to a minimum 20 gauge backing plate attached to wall structural members.
2. Do not attach luminaires directly to gypsum board.

G. Suspended Luminaires:

1. Ceiling Mount:

   a. Two 5/32-inch- diameter aircraft cable supports adjustable to 10 feet in length.
   b. Pendant mount with 5/32-inch- diameter aircraft cable supports adjustable to 10 feet in length.
   c. Hook mount.

2. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
3. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
4. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and wire support for suspension for each unit length of luminaire chassis, including one at each end.
5. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

H. Ceiling-Grid-Mounted Luminaires:

1. Secure to any required outlet box.
2. Secure luminaire to the luminaire opening using approved fasteners in a minimum of four locations, spaced near corners of luminaire.
3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

I. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

2.13 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

2.14 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.
C. Prepare test and inspection reports.

2.15 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

END OF SECTION

SECTION 27 05 00
COMMON WORK RESULTS FOR COMMUNICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Comply with all requirements of Division 26.

1.2 DEFINITION

A. Telecommunications Room: MDF (ER) or IDF (TR or TC).
B. Pathway: Conduit, cable tray, sleeves, junction-hooks and D-rings.

1.3 REFERENCES

A. National Electric Code:

1. NFPA 70 Article 250 Grounding
2. NFPA 70 Article 770 Optical Fiber Cables and Raceways
3. NFPA 70 Article 800 Communications Circuits

B. Telecommunications Industry Association (TIA) and Electronics Industries Association (EIA):

1. ANSI/TIA/EIA-568-A Commercial Building Telecommunications Cabling Standards
2. ANSI/TIA/EIA-569-A Commercial Building Standards for Telecommunications Pathways
3. ANSI/TIA/EIA-607 Commercial Building Grounding and Bonding Requirements for Telecommunications.

C. Underwriters Laboratories, Inc. (UL):

1. UL Standards UL 94HB, UL 723, and UL 2043

D. National Electrical Manufacturers Association (NEMA):

1. NEMA Standards VE-1 Cable Tray Systems

1.4 SUMMARY

A. Pathway System:

1. In general, only devices have been shown on the drawings. The Contractor shall provide a complete pathway system.
2. Minimum raceway size shall be ¾ inch.
3. Unless specified as "open cabling" all wire and cabling shall be installed in continuous metallic raceways according to Division 26, "Raceways and Boxes."
4. Where specified as "open cabling" provide metallic raceways for cables in walls, above inaccessible ceilings, exposed or where subject to physical damage. Minimum raceway size shall be ¾ inch.
5. Raceway fill shall not exceed 40 percent.

B. Wire and Cable:

1. Comply with all requirements of Division 26 and other provisions of this section.
2. Unless specified otherwise, all cablings shall be plenum rated.
3. Provide wire and cable for each system according to the manufacturers requirements.
4. Underground cabling shall be UL listed for direct bury.

1.5 SUBMITTALS

A. Product Data: Submit for each type of product provided.
B. Shop Drawings:

1. Raceway Riser Diagrams: Provide detailed raceway layout. Include designation of devices connected by raceway, raceway type and size, and type and size of wire and cable fill for each raceway run.
2. Site and Floor Plans: Indicate final outlet and device locations, routing of raceways, and cables inside and outside the building.
3. Device Identification: Identify each device by its address or identification number.
4. System Wiring Diagrams: Include system diagrams unique to project. Show connections for all devices, components, and auxiliary equipment. Include diagrams for equipment and for system with all terminals and interconnections identified.
5. Shop drawings shall utilize the final room numbers established by the Owner, not the room and building numbers shown on the architectural floor plans.

PART 2 - PRODUCTS

2.1 GENERAL

A. Comply with all requirements of Division 26 and 27.

2.2 BACKBOARDS

A. Plywood, fire-retardant treated, 3/4 by 48 by 96 inches.

2.3 SLEEVES FOR PATHWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

2.4 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and pathway or cable.

1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of pathway or cable.
2. Pressure Plates: Carbon steel. Include two for each sealing element.
3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.5 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, non-staining, mixed with water to consistency suitable for application and a 30-minute working time.

2.6 Cable tray

A. Provide continuous welded wire mesh cable tray for use in indoor location. The wire mesh size to be 2 inches x 4 inches. The product finish to be electroplated zinc galvanized to an average thickness of 0.7 mils. The cable tray shall sustain a working load of 50 pounds per linear foot with a load (safety) factor of two when tested in accord with NEMA VE 1-3.01.
B. Provide tray and fittings having the following dimensions:

1. Wire mesh size of 2 inch x 4 inch Maximum.
2. Depth of 2 Inches.
3. Tray width as required; between 6 inches and 18 inches.

C. Acceptable Manufacturers:

1. GS Metals Corp., Flextray Cable Management System.
2. Mono-Systems, Inc., Mono-Mesh Cable Tray System.
3. ERICO®, Inc., CADDY®, CatTrax™ or Equal.

2.7 hardware and accessories

A. Provide hot dip galvanized steel nuts, bolts, and lock washers for tray assembly and all adapters, barriers, and covers necessary for a complete installation.

2.8 CABLE RUNWAY

A. Cable Runway: 12 inch wide, 3/8 inch x 1-1/2 inch x 0.065 inch thick rectangular steel tubing with cross members 12 inches on center.
B. Cable Runway Radius Drop: Stringer or cross member as required. Provides 3 inch minimum bend radius.
C. Fittings: Provide factory elbows, tees, bends, splices, connections, and hardware by the same manufacturer.

2.9 J-HOOKS

A. J-Hook Cable Support: Steel Hook, Cat 6 rated, with cable retainer clip.
B. Provide all attachment accessories.

PART 3 - EXECUTION

3.1 PATHWAY INSTALLATION

A. Comply with ANSI/TIA -569-D for pull-box sizing and length of conduit and number of bends between pull points.
B. Comply with the material and installation requirements specified in Division 26, "Raceways and Boxes."
C. Provide long-radius elbows for all underground raceways.
D. Pathway Installation in Equipment Rooms:

    1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
    2. Install cable trays to route cables if conduits cannot be located in these positions.
    3. Secure conduits to backboard when entering room from overhead.
    4. Extend conduits four inches above finished floor.
    5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

3.2 WIRING INSTALLATION

A. Do not share raceways with other building wiring systems.
B. Wiring Within Enclosures: Bundle, lace and train conductors to terminal points. Use lacing bars and distribution spools. Separate power-limited and nonpower-limited conductors as recommended in writing by manufacturer. Install conductors parallel with or at right angles to sides and back of enclosure. Connect conductors that are

terminated, spliced, or interrupted in any enclosure associated with intrusion system to terminal blocks. Mark each terminal according to system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

C. Splices, Taps and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets, and equipment enclosures.
D. Identification of Conductors and Cables: Color code conductors and apply wire markers. Coordinate with shop drawings.

3.3 BACKBOARDS

A. Provide plywood backboards on walls of the telecommunications rooms as indicated on the drawings.
B. Install backboards with 96-inch dimension vertical. Bottom of plywood is to be six inches above finished floor. Butt adjacent sheets tightly and form smooth gap-free corners and joints.
C. Paint backboards flat white.

3.4 SLEEVES

A. Interior Penetrations of Nonrated Walls, Floors and Ceilings: Provide EMT sleeves. Seal space between the raceway and the wall or floor using joint sealant appropriate for the size, depth, and location of the joint. Comply with requirements in Division 07, "Joint Sealants."
B. Fire-Rated Assembly Penetrations:

    1. Provide STI "EZ-Path" assemblies for penetrations at walls, partitions, and ceilings.
    2. Provide EMT sleeves for penetrations and floors. Seal pathway and cable penetration with fire stop materials. Use type and number of sealing elements recommended by manufacturer for pathway or cable material and size. Position pathway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pathway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.5 CABLE TRAY INSTALLATION

A. Run all trays parallel with or perpendicular to building structural members.
B. Stop cable trays at firewalls on both sides and install cables through a multi-cable transit.

C. Where trays are installed in tiers, provide minimum clearance of 12 inches between top and bottom of tray rails.
D. For trays located adjacent to each other, maintain a minimum workspace of 24 inches.
E. Maintain a minimum vertical clearance of six inches from the top of obstructions.
F. Install ventilated covers on cable tray risers to a height of six feet above finished floors.
G. Use factory fittings for all offsets, changes in elevation, or change of direction. Scratch brush all connecting surfaces of splices, plates, and tray, treat with electrical joint compound, and connect immediately.
H. Install tray so that the finished system does not present any sharp edges or projections which may damage cables or be a safety hazard to personnel.
I. Use hold-down bolts to fasten trays to hanger assemblies.

3.6 CABLE RUNWAY INSTALLATION

A. Provide cable runway around perimeter of each telecommunication room with a tee runway routed to and bolted to the top of each telecommunication rack at minimum.
B. Support to wall with triangular support bracket.
C. Provide bonding of runway to ground bus in accordance with Section 270526 “Grounding and Bonding for Communications Systems”.
D. Provide bonding of cable runway system to provide electrically continuous system.
E. Provide protective end caps for all exposed cable runway ends.
F. Provide cable runway radius drop protective plates at each point where cables route down from the cable runway.

3.7 IDENTIFICATION DEVICES

A. Identify system components, wiring, cabling, and terminals according to Division 26, "Identification."

3.8 FIRESTOPPING

A. Provide firestopping to penetrations of fire-rated assemblies to restore original fire-resistance rating of assembly.

3.9 AS-BUILT SHOP DRAWINGS

A. At the completion of the project, provide a complete set of as-built shop drawings (hard copy and CD) showing the following as-built:

1. Raceway layout
2. Device locations
3. Device identification numbers

END OF SECTION

SECTION 27 05 26
GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Grounding conductors.
2. Grounding connectors.
3. Grounding busbars.
4. Grounding rods.
5. Grounding labeling.

1.3 DEFINITIONS

A. BCT: Bonding conductor for telecommunications.
B. TGB: Telecommunications grounding busbar.
C. TMGB: Telecommunications main grounding busbar.
D. Service Provider: The operator of a service that provides telecommunications transmission delivered over access provider facilities.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Shop Drawings: For communications equipment room signal reference grid. Include plans, elevations, sections, details, and attachments to other work.

1.5 INFORMATIONAL SUBMITTALS

A. As-Built Data: Plans showing as-built locations of grounding and bonding infrastructure, including the following:

1. Ground rods.
2. Ground and roof rings.
3. BCT, TMGB, TGBs, and routing of their bonding conductors.

B. Qualification Data: For installation supervisor, and field inspector.
C. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding to include in operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Installation Supervision: Installation shall be under the direct supervision of ITS Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.
2. Field Inspector: Currently registered by BICSI as a designer RCDD to perform the on-site inspection.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
B. Comply with UL 467 for grounding and bonding materials and equipment.
C. Comply with TIA-607-B.

2.2 CONDUCTORS

A. Comply with UL 486A-486B.

B. Insulated Conductors: Stranded copper wire, green or green with yellow stripe insulation, insulated for 600 V, and complying with UL 83.

1. Ground wire for custom-length equipment ground jumpers shall be No. 6 AWG, 19-strand, UL-listed, Type THHN wire.
2. Cable Tray Equipment Grounding Wire: No. 8 AWG.

C. Cable Tray Grounding Jumper:

1. Not smaller than No. 10 AWG and not longer than 12 inches. If jumper is a wire, it shall have a crimped grounding lug with one hole and standard barrel for one crimp. If jumper is a flexible braid, it shall have a one- or two-hole ferrule. Attach with grounding screw or connector provided by cable tray manufacturer.

D. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.

2.3 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.

1. Electroplated tinned copper, C and H shaped.

C. Signal Reference Grid Connectors: Combination of compression wire connectors, access floor grounding clamps, bronze U-bolt grounding clamps, and copper split-bolt connectors, designed for the purpose.
D. Busbar Connectors: Cast silicon bronze, solderless compression-type, mechanical connector; with a long barrel and two holes spaced on 5/8- or 1-inch centers for a two-bolt connection to the busbar.
E. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.4 GROUNDING BUSBARS

A. TMGB: Predrilled, wall-mounted, rectangular bars of hard-drawn solid copper, 1/4 by 4 inches in cross section, length as indicated on Drawings. The busbar shall be NRTL listed for use as TMGB and shall comply with TIA-607-B.

1. Predrilling shall be with holes for use with lugs specified in this Section.
2. Mounting Hardware: Stand-off brackets that provide a 4-inch clearance to access the rear of the busbar. Brackets and bolts shall be stainless steel.
3. Stand-off insulators for mounting shall be Lexan or PVC. Comply with UL 891 for use in 600-V switchboards, impulse tested at 5000 V.

B. TGB: Predrilled rectangular bars of hard-drawn solid copper, 1/4 by 2 inches in cross section, length as indicated on Drawings. The busbar shall be for wall mounting, shall be NRTL listed as complying with UL 467, and shall comply with TIA-607-B.

1. Predrilling shall be with holes for use with lugs specified in this Section.
2. Mounting Hardware: Stand-off brackets that provide at least a 2-inch clearance to access the rear of the busbar. Brackets and bolts shall be stainless steel.
3. Stand-off insulators for mounting shall be Lexan or PVC. Comply with UL 891 for use in 600-V switchboards, impulse tested at 5000 V.

C. Rack and Cabinet Grounding Busbars: Rectangular bars of hard-drawn solid copper, accepting conductors ranging from No. 14 to No. 2/0 AWG, NRTL listed as complying with UL 467, and complying with TIA-607-B. Predrilling shall be with holes for use with lugs specified in this Section.

1. Cabinet-Mounted Busbar: Terminal block, with stainless-steel or copper-plated hardware for attachment to the cabinet.
2. Rack-Mounted Horizontal Busbar: Designed for mounting in 19- or 23-inch equipment racks. Include a copper splice bar for transitioning to an adjoining rack, and stainless-steel or copper-plated hardware for attachment to the rack.
3. Rack-Mounted Vertical Busbar: 72 or 36 inches long, with stainless-steel or copper-plated hardware for attachment to the rack.

2.5 GROUND RODS

A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet in diameter.

2.6 IDENTIFICATION

A. Comply with requirements for identification products in Section 260553 "Identification for Electrical Systems."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Bonding shall include the ac utility power service entrance, the communications cable entrance, and the grounding electrode system. The bonding of these elements shall form a loop so that each element is connected to at least two others.
B. Comply with NECA 1.
C. Comply with TIA-607-B.

3.2 APPLICATION

A. Conductors: Install solid conductor for No. 8 AWG and smaller and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

   1. The bonding conductors between the TGB and structural steel of steel-frame buildings shall not be smaller than No. 6 AWG.
   2. The bonding conductors between the TMGB and structural steel of steel-frame buildings shall not be smaller than No. 6 AWG.

B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2 AWG minimum.
C. Conductor Terminations and Connections:

   1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
   2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
   3. Connections to Ground Rods at Test Wells: Bolted connectors.
   4. Connections to Structural Steel: Welded connectors.

D. Conductor Support:

   1. Secure grounding and bonding conductors at intervals of not less than 36 inches.

E. Grounding and Bonding Conductors:

1. Install in the straightest and shortest route between the origination and termination point, and no longer than required. The bend radius shall not be smaller than eight times the diameter of the conductor. No one bend may exceed 90 degrees.
2. Install without splices.
3. Support at not more than 36-inch intervals.
4. Install grounding and bonding conductors in 3/4-inch PVC conduit until conduit enters a telecommunications room. The grounding and bonding conductor pathway through a plenum shall be in EMT. Conductors shall not be installed in EMT unless otherwise indicated.

    a. If a grounding and bonding conductor is installed in ferrous metallic conduit, bond the conductor to the conduit using a grounding bushing and bond both ends of the conduit to a TGB.

3.3 GROUNDING ELECTRODE SYSTEM

A. The BCT between the TMGB and the ac service equipment ground shall not be smaller than No. 1/0 AWG.

3.4 GROUNDING BUSBARS

A. Indicate locations of grounding busbars on Drawings. Install busbars horizontally, on insulated spacers 2 inches minimum from wall, 12 inches above finished floor unless otherwise indicated.
B. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

3.5 CONNECTIONS

A. Bond metallic equipment in a telecommunications equipment room to the grounding busbar in that room, using equipment grounding conductors not smaller than No. 6 AWG.
B. Stacking of conductors under a single bolt is not permitted when connecting to busbars.
C. Assemble the wire connector to the conductor, complying with manufacturer's written instructions and as follows:

    1. Use crimping tool and the die specific to the connector.
    2. Pretwist the conductor.
    3. Apply an antioxidant compound to all bolted and compression connections.

D. Primary Protector: Bond to the TMGB with insulated bonding conductor.
E. Interconnections: Interconnect all TGBs with the TMGB with the telecommunications backbone conductor. If more than one TMGB is installed, interconnect TMGBs using the grounding equalizer conductor. The telecommunications backbone conductor and grounding equalizer conductor size shall not be less than 2 kcmils/linear foot of conductor length, up to a maximum size of No. 3/0 AWG unless otherwise indicated.
F. Telecommunications Enclosures and Equipment Racks: Bond metallic components of enclosures to the telecommunications bonding and grounding system. Install top-mounted rack grounding busbar unless the enclosure and rack are manufactured with the busbar. Bond the equipment grounding busbar to the TGB No. 2 AWG bonding conductors.
G. Structural Steel: Where the structural steel of a steel frame building is readily accessible within the room or space, bond each TGB and TMGB to the vertical steel of the building frame.
H. Electrical Power Panelboards: Where an electrical panelboard for telecommunications equipment is located in the same room or space, bond each TGB to the ground bar of the panelboard.
I. Shielded Cable: Bond the shield of shielded cable to the TGB in communications rooms and spaces. Comply with TIA-568-C.1 and TIA-568-C.2 when grounding shielded balanced twisted-pair cables.
J. Rack- and Cabinet-Mounted Equipment: Bond powered equipment chassis to the cabinet or rack grounding bar. Power connection shall comply with NFPA 70; the equipment grounding conductor in the power cord of cord- and plug-connected equipment shall be considered as a supplement to bonding requirements in this Section.
K. Access Floors: Bond all metal parts of access floors to the TGB.

3.6 IDENTIFICATION

A. Labels shall be preprinted or computer-printed type.

1. Label TMGB(s) with "fs-TMGB," where "fs" is the telecommunications space identifier for the space containing the TMGB.
2. Label TGB(s) with "fs-TGB," where "fs" is the telecommunications space identifier for the space containing the TGB.
3. Label the BCT and each telecommunications backbone conductor at its attachment point: "WARNING! TELECOMMUNICATIONS BONDING CONDUCTOR. DO NOT REMOVE OR DISCONNECT!"

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
B. Perform tests and inspections.
C. Tests and Inspections:

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 the bonding connections of the system using an ac earth ground-resistance tester, taking two-point bonding measurements in each telecommunications equipment room containing a TMGB and a TGB and using the process recommended by BICSI TDMM. Conduct tests with the facility in operation.

    a. Measure the resistance between the busbar and the nearest available grounding electrode. The maximum acceptable value of this bonding resistance is 100 milliohms.

3. Test for ground loop currents using a digital clamp-on ammeter, with a full-scale of not more than 10 A, displaying current in increments of 0.01 A at an accuracy of plus/minus 2.0 percent.

    a. With the grounding infrastructure completed and the communications system electronics operating, measure the current in every conductor connected to the TMGB. Maximum acceptable ac current level is 1 A.

D. Excessive Ground Resistance: If resistance to ground at the BCT exceeds 5 ohms, notify Architect promptly and include recommendations to reduce ground resistance.
E. Grounding system will be considered defective if it does not pass tests and inspections.
F. Prepare test and inspection reports.

END OF SECTION

SECTION 271500
COMMUNICATIONS HORIZONTAL CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.
B. Refer to Division 27, Section 270500, "Common Work Results for Communications," for general requirements that apply to this section. Comply with all requirements of Section 27 0500.

1.2 DEFINITIONS

A. Refer to Division 27, Section 270500, "Common Work Results for Communications," for definitions that apply to this section.

1.3 Compliance

A. Work and materials shall conform in every detail to the rules and requirements on the National Fire Protection Association and present manufacturing standards. Materials shall be listed by UL and shall bear the UL label.
B. Other applicable standards are as follows: Refer to Division 27, Section 270500, "Common Work Results for Communications," for reference standards that apply to this section.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Contractor must have personnel certified by BICSI on staff.

    1. Layout Responsibility: Preparation of shop drawings shall be under the direct supervision of a BICSI as RCDD.
    2. Installation Supervision: Installation shall be under the direct supervision of a BICSI who shall be present at all times when Work of this Section is performed at project site.

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.
C. Telecommunications Pathways and Spaces: Comply with ANSI/TIA-569-D.
D. Grounding: Comply with ANSI/TIA-607-C.

1.5 Acceptable manufacurers

A. Structured cabling system will include copper cable, termination jacks, outlets, patch panels, patch cords, and connecting hardware. Provide all equipment from one of the following list of approved manufacturers of structured systems: TE Connectivity, Ortronics, Leviton/Berk-tek, CommScope, Corning Cables Systems.

1.6 HORIZONTAL CABLING DESCRIPTION

A. This section describes the products and execution requirements relating to furnishing and installation of Telecommunications Cabling and Termination components as part of a Structured Cabling System. Inter-building, Vertical (Backbone), and Horizontal (Station) cabling comprised of Copper, and Fiber Optic Cabling are covered under this document.

1. ANSI/EIA-568-.1-D requires that a minimum of two telecommunications outlet/connectors be installed for each work area.
2. Horizontal cabling shall contain no more that one transition point or consolidation point between the horizontal cross-connect and the telecommunications outlet/connector.
3. Bridged taps and splices shall not be installed in the horizontal cabling.
4. Splitters shall not be installed as part of the optical fiber cabling.

1.7 SCOPE OF WORK

A. The Contractor shall provide all labor and materials necessary to construct the system as described herein. This includes - but is not limited to- furnishing and installing cable, cable supports, interduct, racking, termination components, termination, testing, labeling and documentation. In general, the system shall consist of:

1. Horizontal Category 6, 4-pair Unshielded Twisted Pair (UTP) Copper Cables installed from the work area outlet to the Main Distribution Frame (MDF) serving that area.

B. The telephone switch, handsets and all electronic networking equipment will be furnished and installed by the Owner.

1.8 PERFORMANCE REQUIREMENTS

A. General Performance: Horizontal cabling system shall comply with transmission standards in ANSI/EIA-568-.1-D when tested according to test procedures of this standard.
B. UTP Performance: Balanced twisted-pair telecommunications cabling, and component backbone cabling system shall comply with transmission standards in ANSI/TIA-568-C.2 when tested according to test procedures of this standard.
C. OFC Performance: Optical Fiber cabling and component backbone cabling system shall comply with transmission standards in ANSI/TIA-568-C.3 when tested according to test procedures of this standard.

1.9 SUBMITTALS

A. Other applicable standards are as follows: Refer to Division 27, Section 27 0500, "Common Work Results for Communications," for reference standards that apply to this section.
B. Submittal information shall include the name of each authorized installer who may be used in the conduct of the project, and evidence of certification.

1.10 COMPLIANCE

A. Work and materials shall conform in every detail to the rules and requirements on the National Fire Protection Association and present manufacturing standards. Materials shall be listed by UL and shall bear the UL label.
B. Other applicable standards are as follows: Refer to Division 27, Section 27 0500, "Common Work Results for Communications," for reference standards that apply to this section.
C. The telecommunications contractor shall be a firm which is regularly and professionally engaged in the business of the installation and testing of the specified telecommunications system and equipment.
D. The telecommunications contractor shall have a minimum of half (50 percent) of the installers trained to ensure the proper installation and testing of copper and fiber optics structured cabling systems. The Contractor shall submit evidence of compliance with this requirement prior to having the individuals start any work on the product.

1.11 WARRANTY

A. An extended project warranty and system assurance warranty for this structured cabling system shall be provided and consist of the following:

1. Extended Product Warranty: The extended product warranty shall support the current and approved applications for which it was initially designed. Such applications must utilize the current ANSI/TIA-568 specifications that define component, link, channel, and backbone performance for structured cabling systems.
2. Application Assurance: Applications assurance for the horizontal and backbone systems specifications of applications that have been designed to operate over the structured cabling system (cable and connectivity interface hardware). These components shall meet or exceed all performance and testing requirements of the current and approved ANSI/TIA-568 Telecommunications Standard at the time of installation.
3. System Certification: Upon successful completion of the installation and subsequent inspection, the customer shall be provided with a numbered certificate from the manufacturing company registering the installation.
4. The Extended Product Warranty and the System Assurance shall cover the replacement or repair of defective product(s) and labor for the replacement or repair of such defective product(s).
5. The warranty shall extend from the date of substantial completion to the longer of fifteen years or the length of the standard warranty offered by the manufacturer.
6. The warranty shall be extended to the Owner via the manufacturer through a single point of contract and shall be fully backed by the manufacturer. Prior to starting work, the Contractor shall submit to the Owner written proof of qualification to offer the manufacturer's warranty.
7. The Telecommunications Contractor shall submit after installation all documentation to support the warranty in accordance with the manufacturer’s warranty requirements, and to apply for said warranty on behalf of the District. A valid warranty claim will cover the components and labor associated with the repair/replacement of any failed link within the warranty period.

PART 2 - PRODUCTS

2.1 PATHWAYS

A. General Requirements: Comply with ANSI/EIA-569-D.
B. Only devices and cable tray have been shown on the drawings. The Telecommunications Contractor is responsible to provide a complete design-build pathway system. The Telecommunications shop drawings shall contain a fully designed pathway systems.

C. Cable Support: NRTL labeled for support of Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.

   1. Support brackets with cable tie slots for fastening cable ties to brackets.
   2. Lacing bars, spools, junction hooks and D-rings.
   3. Straps and other devices.

D. Cable Trays: Comply with the requirements of Division 26.
E. Conduit and Boxes: Provide single gang plaster ring on a 4-11/16 inch square, 2-1/8 inch deep box for each outlet unless noted otherwise. Comply with requirements in Division 26, Section 26 0533, "Raceway and Boxes."
F. Cable Runway: 12 inch wide cable runway with grey finish and 12 inch rung spacing. Provide supports and all required fittings, including dropouts at racks. Install around the perimeter and above equipment racks in the Main Distribution Frame (MDF) Chatsworth #10250-XXX.
G. Pull String: Provide nylon pull string for all empty raceways.

2.2 Category 3 110-PUNCH DOWN BLOCKS

A. Category 3 voice backbone cables shall terminate on wall mounted 110-punch down blocks.
B. Manufacture: Ortronics Part # OR-30200007
C. Provide cross-connect frames for all 110-punch down blocks.

2.3 CATEGORY 3 MODULAR PATCH PANEL

A. Provide Category 3, non keyed RJ45 modular to 110 printed circuit board, high density Telco patch panels.
B. Patch panels shall be installed on equipment racks as specified herein and used for termination of Category 3 telephone distribution cables at the Main Distribution Frame (MDF) as detailed on the drawings.
C. Manufacturer: Ortronics Part # OR-808004042.

2.4 CATEGORY 6 MODULAR PATCH PANEL

A. Provide Category 6 non keyed RJ45 modular to 110 printed circuit board style Patch Panels. The largest Patch Panel configuration shall not exceed 48 ports.

B. The Patch Panel as a system (including jack, cable interface and intermediate components) must maintain Category 6 performance per the referenced TIA/EIA standards.
C. Patch Panels shall incorporate cable support and or strain relief mechanisms to secure the horizontal cables at the termination block to ensure that the minimum bend radius specifications are adhered to.
D. Patch Panels shall be installed on equipment racks as specified herein and used for termination of all horizontal station cables at the Main Distribution Frame (MDF). Provide one port for each jack on each outlet plus a minimum of 10 percent spare ports.
E. Manufacturer: Ortronics Part # OR-PHD66U48HM.

2.5 HORIZONTAL CABLING

A. High Speed Cables (Category 6: UTP, 4 Pair).

1. Horizontal cables shall be extended between the work area location and its associated Intermediate Distribution Frame (IDF) or the Main Distribution Frame (MDF) and shall consist of 100 OHM Category 6, 4 pair, 23 gauge, Unshielded Twisted Pair (UTP) cable.
2. The 4 pair Category 6, UTP cable shall be UL Listed Type CMP (plenum).
3. All 4 pair Category 6 cables shall conform to ANSI/TIA-568-C.2 Balanced Twisted-Pair Telecommunications Cabling and Components Standards, and ANSI/TIA-568-C.2 Category 6 requirements.
4. UL or ETL Verified for Category 6 Electrical Performance.
5. Manufacturer: Berk-Tek LANmark-6 Part # 101329XX.

2.6 WORK AREA OUTLETS

A. Horizontal cables shall be terminated at their designated work area location in the connector types described in the subsections below. Included are modular telecommunications jacks. These connector assemblies shall snap into a faceplate.
B. The Telecommunications outlet Assembly shall accommodate:

1. Minimum of Two (2) modular connectors.
2. Additional accommodations for specific locations as noted in the plans for Optical Fiber and / or additional copper cables as necessary.
3. Blank filler will be installed when extra ports are not utilized.
4. Multiple jacks that are identified in close proximity on the drawings (but not separated by a physical barrier) may be combined in a single assembly.

5. Same orientation and positioning of jack and connectors shall be utilized throughout the installation.

C. Modular Jacks:

1. Modular jacks shall be 8-position and shall meet ANSI/EIA-568-C.2 requirements.
2. Interface between the jack and the station cable shall be of a 110 style block or insulation displacement type contact. Termination components shall be designed to maintain the cables pair twists as closely as possible to the point of mechanical termination.
3. Manufacturer: Ortronics, Category 6, TracJack Series, Part #OR-TJ645-XX.

D. Faceplates:

1. Ortronics TracJack style as appropriate to fit the modular jack used.
2. Match the faceplate color used for other utilities in the building or as specified by the Engineer or Owner.
3. Comply with ANSI/EIA-606-B work area labeling standard.
4. Manufacture: Ortronics, TracJack Series, Part #OR-4030054X.

2.7 EQUIPMENT RACKS

A. Equipment racks shall be equipped as detailed on the drawings and as specified below.
B. Equipment racks shall be 19 inches x 84 inches, aluminum, and have a clear finish Chatsworth # 48353-503. Provide the following accessories as detailed on the drawings and as specified below:

1. Rack Cabling Section: Chatsworth #10250-112.
2. Grounding Kit: Chatsworth #08009-001. Provide one kit for each rack.
3. Shelves: Provide the following shelves. Install in the equipment racks as directed by the Owner.
4. Full size sliding keyboard and mouse tray: Chatsworth # 12193-501
5. Adjustable Monitor Shelf: Chatsworth # 11245-519
6. Low Profile Shelf: Chatsworth # 11293-519
7. Mounting Shelf: Chatsworth # 40074-500. Provide one per rack.
8. Power Strip: Ortronics #OR-50900052. Provide one per rack.
9. Cable Runway: Chatsworth # 10250-112. Attach to center rack and backboard using manufacture's standard mounting brackets.
10. Cable Management Straps: Chatsworth # 02009-203. Provide 50 ea
11. Wire Management Center: Ortronics # OR-808045030. Provide one for each patch panel installed in equipment racks. Mount immediately below each patch panel.

C. Equipment racks shall comply with International Building Code (IBC) for the seismic area in which it is to be installed.

2.8 WALL-MOUNTED EQUIPMENT RACKS

A. Wall-mounted equipment racks shall be swing gate style, 19 inch W x 24 inch D, aluminum with steel extension brackets, and have a black finish. Provide the following accessories as detailed on the drawings and as specified below:

1. Swing Gate Wall Rack and Heavy-Duty Swing Gate Kit: Wall rack, Chatsworth 11790-725 (13 RU), 11791-725 (21 RU), 11807-725 (27 RU), or 11792-725 (41 RU) based on RU as indicated on plans, 27 RU if not noted otherwise. Gate kit, Chatsworth 12795-701.
2. Grounding Kit: As specified in Paragraph 2.11 B.
3. Horizontal Rack Busbar: As specified in Paragraph 2.11 B.
4. Cable Management Straps: As specified in Paragraph 2.11 B.
5. Horizontal Cable management: As specified in Paragraph 2.11 B.

B. Equipment racks shall comply with International Building Code (IBC) for the seismic area in which it is to be installed.

2.9 WALL-MOUNTED EQUIPMENT CABINETS

A. Wall-mounted equipment cabinets shall be swing gate style, 24inch W x 24 inch D, aluminum with steel extension brackets, and have a black finish. Provide the following accessories as detailed on the drawings and as specified below:

1. CUBE-iT Wall-Mounted Cabinet: Wall cabinet, Chatsworth 11900-724 (24-in H, 12 RU), 11900-736 (36-in H, 18 RU), 11900-748 (48-in H, 26 RU), 13495-760 (60-in H, 33 RU), or 13495-772 (72-in H, 40 RU) based on RU as indicated on plans, 26 RU if not noted otherwise.
2. Grounding Kit: As specified in Paragraph 2.11 B.
3. Horizontal Rack Busbar: As specified in Paragraph 2.11 B.
4. Cable Management Straps: As specified in Paragraph 2.11 B.
5. Horizontal Cable management: As specified in Paragraph 2.11 B.

B. Equipment cabinets shall comply with International Building Code (IBC) for the seismic area in which it is to be installed.

2.10 GROUNDING AND BONDING

A. The facility shall be equipped with a Telecommunications Bonding Backbone (TBB). This backbone shall be used to ground all telecommunications equipment, racks, cabinets, raceways, and other associated hardware that

has the potential to act as a current carrying conductor. The TBB shall be installed independent of the building's electrical and building ground and shall be designed in accordance with the recommendations contained in the ANSI/TIA-607-C.

B. The Main Distribution Frame (MDF) is equipped with a Telecommunications Main Grounding Bus bar (TMGB). The TMGB shall be connected to the building electrical entrance grounding facility. The intent of this system is to provide a grounding system that is equal in potential to the building electrical ground system.
C. All racks, cabinets, cable trays, etc entering or residing in the Main Distribution Frame (MDF) shall be grounded to the TMGB using a minimum #6 AWG stranded copper bonding conductor and compression connectors.
D. Wire used for telecommunications grounding purposes shall be identified with a green insulation. Non-insulated wires shall be identified at each termination point with a wrap of green tape.
E. Telecommunications Grounding Busbar:

1. Connectors: Mechanical type, cast silicon bronze, solderless, compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
2. Ground Bus Bar: Copper, minimum 1/4 inch thick by four inches wide with 9/32-inch holes spaced 1-1/8 inches apart.
3. Stand-Off Insulators: Comply with UL 891 for use in switchboards, 600 volts. Lexan or PVC, impulse tested at 5000 volts.
4. Telecommunications Main Grounding Busbar (TMGB): Chatsworth 40158-012.
5. Telecommunications Grounding Busbar (TGB): Chatsworth 40156-012.

F. Comply with ANSI/TIA-607-C.

PART 3 - EXECUTION

3.1 GENERAL

A. Copper Pair counts of the cables to be supplied are detailed on the Project Drawings. The Telecommunications Contractor shall furnish and install all cables, connectors and equipment as shown on the drawings and specified above. IT shall be noted that all cables shall be installed in continuous lengths from endpoint to endpoint. No splices shall be allowed unless noted otherwise.

B. It is the Telecommunications Contractors responsibility to survey the site and include all necessary costs to perform the installation as specified.
C. Cable installation shall be done in accordance with the cable manufacture's recommendations and ANSI/IEEE C2 standards. Recommended pulling tensions and bending radius shall not be exceeded.
D. Should it be found by the Engineer, that the materials or any portion thereof, furnished and installed under this contract fail to comply with the specifications and drawings, with the respect or regard to the quality, amount of value of materials, it shall be rejected and replaced by the Telecommunications Contractor and all work distributed by changes necessitated in consequence of said defects or imperfections shall be made good at the Telecommunications Contractors expense.

3.2 INSTALLATION

A. Raceways: Terminate raceways 6 inches above suspended ceilings horizontally and provide plastic bushing on all metal raceways. Provide each raceway with nylon pull string.
B. Raceway Routing: Raceways, where required, shall be stubbed into nearest accessible ceiling space or crawl space. Coordinate with General Contractor and Architect to confirm spaces that are considered accessible.
C. Raceway Installation

1. Comply with NECA 1.
2. Comply with BICSI TDMM for layout and installation of communications equipment rooms.
3. Cable Trays: Comply with NEMA VE 2 and ANSI/TIA-569-D.
4. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
5. Separation from EMI Sources:

    a. Comply with BICSI TDMM and ANSI/TIA-569-D for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
    b. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

        1) Electrical Equipment Rating Less Than 2kVA: A minimum of five inches.
        2) Electrical Equipment Rating between 2 and 5kVA: A minimum of 12 inches.

3) Electrical Equipment Rating More Than 5kVA: A minimum of 24 inches.

c. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

1) Electrical Equipment Rating Less Than 2kVA: A minimum of 2-1/2 inches.
1) Electrical Equipment Rating between 2 and 5kVA: A minimum of six inches.
2) Electrical Equipment Rating More Than 5kVA: A minimum of 12 inches.

d. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

1) Electrical Equipment Rating Less Than 2kVA: No requirement.
1) Electrical Equipment Rating between 2 and 5kVA: A minimum of three inches.
2) Electrical Equipment Rating More Than 5 kVA: A minimum of six inches.

e. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
f. Separation between Communications Cables and Fluorescent Fixtures: A minimum of five inches.

D. Voice Backbone Cabling:

1. At the Main Distribution Frame (MDF) all Voice Backbone Cables shall be terminated on a high density horizontal 110 style blocks. 25 Pair tie cables shall be installed from the 110 blocks to the voice patch panels located in rack #2
2. Horizontal Troughs incorporating split plastic distribution rings shall be provided by the Telecommunications Contractor to accommodate routing of jumpers. Troughs shall be positioned at the top of each column of termination blocks and between each 100-pair wiring block.
3. Termination of Voice Backbone Cabling shall be accomplished by utilizing five pair (e.g., C5-type) clips.

E. Horizontal Cabling:

1. All horizontal station cabling shall terminate on modular patch panels in the Main Distribution Frame (MDF) as specified on the drawings.
2. The maximum station cable drop length shall not exceed 295-feet (90-meters) in order to meet the performance specifications. The Telecommunications Contractor is responsible for installing station cable

in a fashion as to avoid unnecessarily long cable runs. Any area that cannot be reached within the above constraints should be identified and reported to the Engineer prior to installation. Changes to the plan shall be approved by the Engineer.

3. Arrangement of cables at the patch panels shall be in ascending order of outlet numbers.
4. Do not install cabling in conduit or sleeves without plastic bushings.
5. Do not bind cables tightly together with wraps. Wraps shall slip loosely around cable.
6. No more than 50 cables shall be installed in a single bundle.
7. All cables shall be free from tension at both ends. In cases where the cable must bear some stress, Kellom grips may be used to spread the strain over a longer length of cable.
8. Maintain twists in pairs of wire to within 1/2 inch of termination.
9. Installation shall meet industry standards for Category 6 installation.

F. Telecommunications Outlets:

1. Cables shall be dressed and terminated in accordance with the recommendations made in ANSI/TIA -568 document.
2. Pair untwist at the termination shall not exceed .24 inches for Category 6 connecting hardware.
3. Bend radius of the cable in the termination area shall not be less than four times the outside diameter of the cable.
4. The cable jacket shall be maintained as close as possible to the termination point.

G. Equipment Racks and Cabinets:

1. The Telecommunications Contractor shall install the racks as recommended by the manufacture. Multiple racks shall be joined, and the ground made common on each. The Equipment racks shall be stabilized by the installation of overhead cable tray which the cabling accesses the equipment racks.
2. All racks shall be grounded to the Telecommunications ground buss bar.
3. All Racks shall comply with zone4 seismic compliance.

H. Patch Panels: Provide sufficient positions to terminate all cables plus 20 percent spare capacity.

3.3 GROUNDING

A. Install grounding according to BICSI TDMM, "Bonding and Grounding (Earthing)" Chapter.
B. Comply with ANSI/TIA-607-C.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least two-inch clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical to building ground.
D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor. Bond the shield of shielded cable to the grounding bus bar in communications rooms and spaces.
E. At the Main Distribution Frame (MDF), and at the Electrical Service Entry, a “Telecommunications Grounding Busbar (TGB) shall be provided and installed.
F. Provide a ground terminal block at each equipment rack.
G. Where multiple racks are installed in the same room, bond all racks together with a #6 stranded copper ground conductor.

3.4 FIRESTOPPING

A. Comply with requirements in Division 07, "Penetration Firestopping."
B. Comply with ANSI/TIA-569-D, Annex A, "Firestopping."
C. Comply with BICSI TDMM, "Firestopping Systems."

3.5 IDENTIFICATION

A. Refer to Division 27, Section 27 0500, "Common Work Results for Communications," for labeling requirements that apply to this section.

3.6 INSPECTION PROCEDURES

A. The Owner will conduct periodic inspections of the work in progress. Inspections by the Owner in no way limit the Contractor's responsibility for compliance with the contract documents.
B. The Owner reserves the right to hire an independent testing company to spot check the test results. If the results vary more than 10 percent from the results provided by the Contractor, the Contractor will be required to correct any deficiencies and retest the entire system at no additional cost to the project.

3.7 TERMINATIONS

A. The Contractor shall terminate, test, and label all copper and fiber optic cables.
B. Terminations must be made by certified personnel in strict accordance with the connector manufacturer's installation procedure. As a condition of contract award, the Contractor must provide evidence that the personnel performing terminations are certified by the connector manufacturer.
C. Fiber optic cables must be terminated such that the strength member of each cable is mechanically secured to the patch panel bracket or clamp so that any tension on the cable will not stress the individual fibers.

3.8 ACCEPTANCE TESTING PROCEDURES

A. General:

1. Provide a detailed test procedure for approval by the Owner prior to beginning testing. The Owner reserves the right to witness all testing.
2. Upon completion of all testing a certified test report shall be provided. The report shall include the following information as a minimum:

   a. Copy of the approved test procedure
   b. Date(s) of test
   c. Individual(s) performing the test
   d. Make, model number and serial number of all test equipment
   e. Cable identification number and the associated test results

B. The cabling must be installed, and the final test reports delivered to the Owner two weeks prior to substantial completion. Test reports shall be bound in a separate volume of the O & M manual
C. Prior to beginning any testing, the Contractor shall schedule a walk-through with the Owner and the Engineer to review the installation.
D. UTP Cabling: All UTP cabling will be certified to meet or exceed the specifications as set forth in ANSI/TIA-568-C.2 for channels, permanent links, and horizontal cables. Certifications shall include the following parameters for each pair of each cable installed:

	Category 3	Category 6
Channel Transmission Performance		
Wire Map	✓	✓
Length	✓	✓

Return Loss		✓
Insertion Loss	✓	✓
NEXT	✓	✓
PSNEXT		✓
ACRF		✓
PSACRF		✓
Propagation Delay	✓	✓
Propagation Delay Skew	✓	✓
Permanent Link Transmission Performance		
Return Loss		✓
Insertion Loss	✓	✓
NEXT	✓	✓
PSNEXT		✓
ACRF		✓
PSACRF		✓
Propagation Delay	✓	✓
Propagation Delay Skew	✓	✓
Horizontal Cable Transmission Performance		
Structural Return Loss	✓	
Return Loss		✓
Insertion Loss	✓	✓
NEXT	✓	✓
PSNEXT		✓
ACRF		✓
PSACRF		✓
TCL		✓
ELTCTL		✓
Propagation Delay	✓	✓
Propagation Delay Skew	✓	✓

NEXT - Near-end crosstalk
PSNEXT - Power sum near-end crosstalk
ACRF - Attenuation to crosstalk ratio, far-end
PSACRF - Power sum attenuation to crosstalk ratio, far-end
TCL - Transverse conversion loss
ELTCTL - Equal level transverse conversion transfer loss
PSANEXT - Power sum alien near-end crosstalk
PSAACRF - Power sum attenuation to alien crosstalk ratio, far-end

E. Provide a hard copy of all test results. Each cable shall be identified by its jack number.

3.9 AS-BUILT DRAWINGS

A. The Contractor shall provide the following at the completion of the project:

1. As-built shop drawings (hard copy & disc) showing the as-built locations of all components, conduit runs, and cables utilized.
2. One set of 18 inches x 24 inches floor plans (hard copy and disk) showing only the telephone/data outlets and associated jack numbers.

END OF SECTION

SECTION 31 20 00
EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Excavating and filling for rough grading the Site.
2. Fill material for pad.

1.2 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

C. Fill: Soil materials used to raise existing grades.
D. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other fabricated stationary features constructed above or below the ground surface.
E. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
F. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:

1. Classification according to ASTM D2487.
2. Laboratory compaction curve according to ASTM D698 or ASTM D1557.

1.4 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Do not proceed with work on adjoining property until directed by Architect.

C. Utility Locator Service: Notify the Alaska Digline at 811 a minimum 7-days prior to beginning earth-moving operations.
D. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D2487 or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

1. Liquid Limit: 30% to 35%.
2. Plasticity Index: 12% to 22%.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D2487 or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.
B. Protect and maintain erosion and sedimentation controls during earth-moving operations.
C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 EXPLOSIVES

A. Explosives:

1. Do not use explosives.

3.3 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.4 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Engineer.

3.5 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

    1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.6 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
B. Place and compact fill material in layers to required elevations as follows:

    1. Under building, use engineered fill.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.7 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

    1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.

    2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.8 COMPACTION OF FILLS

A. Place fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
B. Place fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D698:

    1. Fill pad, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.

3.9 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

   1. Provide a smooth transition between adjacent existing grades and new grades.
   2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:

   1. Gravel Pads: Plus or minus 1 inch.

3.10 FIELD QUALITY CONTROL

A. Special Inspections: Contractor will engage a qualified special inspector to perform the following special inspections:

   1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
   2. Determine that fill material classification and maximum lift thickness comply with requirements.
   3. Determine, during placement and compaction, that in-place density of compacted fill complies with requirements.

B. Testing Agency: Contractor will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

D. Testing agency will test compaction of soils in place according to ASTM D1556, ASTM D2167, ASTM D2937, and ASTM D6938, as applicable. Tests will be performed at the following locations and frequencies:

   1. Gravel Pad Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of gravel area but in no case fewer than three tests.

E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or

remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.11 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

    1. Scarify or remove and replace soil material to depth as directed by Engineer; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

    1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.12 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION

SECTION 32 31 00
FENCE AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Wire mesh.
2. Swing gates.

1.3 ACTION SUBMITTALS

A. Product Data: For each of the following types of products.

1. Wire mesh types
2. Burlap
3. Posts
4. Fasteners

B. Shop Drawings: For fencing and gates.

1. Include plans, elevations, sections, gate locations, post spacing, and mounting details.

C. Manufacture’s standard warranty for”

1. Each woven wire type.
2. Each woven wire finish type.

D. Samples: For each fence material and for each color specified.

1. Provide Samples 12 inches in length for linear materials.

a. All posts and fasteners.

2. Provide Samples 12 inches square for wire mesh.

3. Provide Samples 12 inches square for burlap.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS (NOT USED)

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.
B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Individual mockups shall be provided for:

a. Fence Type 1
b. Fence Type 2
c. Fence Type 3

2. Include 300 feet length of fence complying with requirements.

a. Must include a single H-Brace

3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS

2.1 FENCE MATERIALS

A. Wing Fence

1. Woven Wire Metal Mesh: Basis-of-Design: Subject to compliance with requirements, provide Bekaert, Solidlock Pro, Game Fence fixed knot 20/96-6-12.5 or approved equal.

a. Knot type: fixed knot
b. Number of line wires: 20
c. Mesh height: 96 inches
d. Spacing of Vertical Wires: 6 inches
e. Spacing of horizontal wires (starting with top wire as row 1):

1) Row 1 to 5: 7 inches between each wire
2) Row 6 to 9: 6 inches between each wire
3) Row 10 to 11: 5 inches between each wire
4) Row 12 to 13: 4 inches between each wire
5) Row 14 to 20: 3 inches between each wire

f. Vertical & Horizontal Wire diameter: 12.5 gauge
g. Finish: Basis of design is Baekert Bezinal a minimum 5% zinc aluminum coating with a minimum coat wight of 0.80 oz per square foot or approved equal.
h. Warranty: Manufacturer's standard 30 year limited warranty.

2. Posts:

a. Line Posts: Type 1:Wood: 4 inch by 4 inch by 12 foot Pressure Treated Timber with 0.60 CCA

3. Fasteners:

a. For attaching to mesh to wood posts: Bekaert 2" 8 ga Double Barbed Staples
b. Finish: Bezinal coated wire
c. Foundations: as indicated on drawings
d. Warranty: Manufacturer's standard warranty.

4. Mesh Tension

a. Tension on the top wire shall be such that a lateral force of 20 pounds applied midway between the posts shall cause no more than six inches of displacement from a straight line between the two adjacent fastening points when pulled laterally. Tension on any interior horizontal wire shall be such that a lateral force of 20 pounds applied midway between the posts shall cause no more than six inches of displacement from a straight line between the two adjacent fastening points when pulled laterally.

B. Corral Fence

1. Woven Wire Metal Mesh: Basis-of-Design: Subject to compliance with requirements, provide Bekaert, Solidlock Pro, Game Fence fixed knot 20/96-6-12.5 or approved equal.

a. Knot type: fixed knot
b. Number of line wires: 20
c. Mesh height: 96 inches
d. Spacing of Vertical Wires: 6 inches
e. Spacing of horizontal wires (starting with top wire as row 1):

1) Row 1 to 5: 7 inches between each wire

2) Row 6 to 9: 6 inches between each wire
3) Row 10 to 11: 5 inches between each wire
4) Row 12 to 13: 4 inches between each wire
5) Row 14 to 20: 3 inches between each wire

f. Vertical & Horizontal Wire diameter: 12.5 gauge
g. Finish: Basis of design is Baekert Bezinal a minimum 5% zinc aluminum coating with a minimum coat wight of 0.80 oz per square foot or approved equal.
h. Warranty: Manufacturer's standard 30 year limited warranty.

2. Fence Fabric: Burlap, provide 48" tall by 100 yard roll 100% jute fiber
3. Posts:

a. Line Posts: Type 1:Wood: 4 inch by 4 inch by 12 foot Pressure Treated Timber with 0.60 CCA

4. Fasteners:

a. For attaching to mesh and burlap to wood posts: Bekaert 2" 8 ga Double Barbed Staples
b. Finish: Bezinal coated wire
c. Foundations: as indicated on drawings
d. Warranty: Manufacturer's standard warranty.

5. Mesh Tension

a. Tension on the top wire shall be such that a lateral force of 20 pounds applied midway between the posts shall cause no more than six inches of displacement from a straight line between the two adjacent fastening points when pulled laterally. Tension on any interior horizontal wire shall be such that a lateral force of 20 pounds applied midway between the posts shall cause no more than six inches of displacement from a straight line between the two adjacent fastening points when pulled laterally.

C. Holding Pocket Fence

1. Materials: Materials shall be treated wood, or wood of natural resistance to decay. All wood shall be construction grade 2 or better.
2. Wood Posts:

a. Line Posts: Wood posts shall conform to the details and dimensions indicated on the DRAWINGS. Wood posts shall be straight, sound, and seasoned with ends sawed off square or as indicated. All knots shall be trimmed flush with the surface. Wood posts shall be peeled and treated with preservative in accordance with AASHTO M133.

b. All dimension timber and lumber required for fences or gates shall be sound, straight, and free from knots, splits, and shakes. It shall be of the species and grades indicated on the DRAWINGS. Posts at Swing Gate Openings: Wood: 6 inch by 8 foot Pressure Treated Timber with 0.60 CCA

3. Fasteners:

   a. All fasteners used for construction shall be galvanized.

4. Foundations: as indicated on drawings
5. Warranty: Manufacturer's standard warranty.

2.2 SWING GATES

A. Gate Configuration: as shown in drawings
B. Gate Frame Height: as shown on drawings.
C. Gate Opening Width: as shown on drawings
D. Frame Corner Construction: as indicated on drawings
E. Additional Rails: Provide as indicated, complying with requirements for corral fence rails.
F. Infill Fence Fabric: Basis-of-Design Burlap, 100% jute fiber.
G. Hardware: Latches permitting operation from both sides of gate, hinges, and keepers for each gate leaf more than 5 feet wide as indicated on drawings.
H. Spring Hinges: as indicated on drawings
I. Cane Bolts: Provide for inactive leaf of pairs of gates. Fabricated from 1/2-inch-diameter, round steel bars, hot-dip galvanized after fabrication. Finish to match gates. Provide galvanized-steel pipe strikes to receive cane bolts in closed position.
J. Metallic-Coated-Steel Finish: class II hot dipped galvanized.

2.3 SLIDING GATES

A. Gate Configuration: as shown in drawings.
B. Gate Frame Height: as shown on drawings.
C. Gate Opening Width: as shown on drawings

D. Frame Corner Construction: as indicated on drawings.
E. Additional Rails: Provide as indicated, complying with requirements for corral fence rails.
F. Gate Track: as shown on drawings.
G. Infill Fence Fabric: Burlap, 100% jute fiber.

2.4 GATE MATERIALS

A. Gate Fabric: Basis-of-Design Burlap, 100% jute fiber.
B. Gate frame material: pressure treated wood shall be treated in accordance with Wood Protection Association (AWPA) Use Category 4A (UC4A) for ground contact with minimum 0.60 pcf CCA. Sizes as indicated on drawings.
C. Plates, Shapes, and Bars: ASTM A36/A36M.
D. Metallic-Coated Steel Sheet: Galvanized-steel sheet or aluminum-zinc, alloy-coated steel sheet.
E. Aluminum-Zinc, Alloy-Coated Steel Sheet: ASTM A792/A792M, structural quality, Grade 50 , with AZ60 coating.
F. Iron Castings: Either gray or malleable iron unless otherwise indicated.

1. Gray Iron: ASTM A48/A48M, Class 30.
2. Malleable Iron: ASTM A47/A47M.

G. Galvanizing: For components indicated to be galvanized and for which galvanized coating is unspecified, triple dipped hot-dip galvanize to comply with ASTM A123/A123M. For hardware items, hot-dip galvanize to comply with ASTM A153/A153M.

PART 3 - EXECUTION

3.1 SITE CONDITIONS

A. The contractor should expect multiple substrate types as follows:

1. Permafrost – Permanently frozen soils. Posts must be driven into the permafrost at a depth to minimize heaving.
2. Savoonga is underlain by clayey silt that contains basalt boulders overlain by a layer of peat, roots, and organic material up to a foot thick.

3.2 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, fence layout, and other conditions affecting performance of the Work.
B. Do not begin installation unless otherwise permitted by Architect.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 PREPARATION

A. All fences to follow what is indicated on drawings.
B. All fence posts shall be placed as indicated on drawings.

3.4 FENCE INSTALLATION

A. General installation instructions:

1. Clear and grub installation areas as needed for construction.
2. The Contractor must locate the project's location starting point and end point as shown on the drawings.
3. The Contractor's personnel must travel to work area with reliable four-wheel drive vehicles or water-craft following all applicable rules and regulations.
4. The placement sequence shall be coordinated with the CO.
5. All fences will follow what is indicated on drawings or as determined by the CO.
6. No gaps or breaches are allowed in the fence during construction.
7. Fence will not enter existing surface water boundaries and remain on tundra as indicated on drawings.
8. Distance between posts is in accordance with the drawings.
9. If unable to drive posts in tundra, post placement may be adjusted within alignment limits up to 20 degrees.
10. All wrapped wire ends connecting separate wire rolls will have at least four full turns and cut flush to reduce the hazard of impalement.
11. Fence staples require one staple per foot on posts
12. Changes in fence alignment of 20 degrees or more will not be allowed.
13. Refer to drawings for illustrations on fence assembly.

B. 4" X 4" Treated Wood Posts

1. Treated posts will be installed as indicated on the drawings from each, and additionally so that a post is placed at ALL significant high and low points along the fence line.

2. Treated posts will be oriented so that the flat side faces the area to be enclosed. Posts will be driven to a minimum depth of eighteen (48) inches; in a manner that will prevent damage to the posts and the treatment. Where posts installation encounters underground debris preventing installation, post placement may be adjusted within alignment limits up to 20 degrees and returned smoothly to indicated alignment.
3. Posts shall be installed plumb and true to line and grade. Posts which are bent, split, mushroomed, cracked, twisted or have cracked, chipped, or scratched coatings will not be used.

C. Mesh Tension

1. Tension on the top wire shall be such that a lateral force of 20 pounds applied midway between the posts shall cause no more than six inches of displacement from a straight line between the two adjacent fastening points when pulled laterally. Tension on any interior horizontal wire shall be such that a lateral force of 20 pounds applied midway between the posts shall cause no more than six inches of displacement from a straight line between the two adjacent fastening points when pulled laterally.

D. Fence Staples

1. Fence clips shall be installed as indicated on drawings. All clips will be so the ends spread internally into wood post an not cross.

E. Splices

1. Where two sections of woven wire need to be joined, crimps will not be allowed. Wires will be adjoined at posts by overlapping the terminal ends of each of the wire mesh rolls and mechanically attaching to the post. Excess wire will be cut flush to wrapped wire to reduce the hazard of impalement.

F. Wire-to-Ground Interface

1. The bottom strand of the mesh wire will be fastened to each post so that it is flush with the surface of the ground or no more than 1” above the surface of the ground at any given point along the fence line.
2. For this document, the surface of the ground is defined as the actual soil surface and not the vegetation mat. The vegetation mat and soil shall be removed manually along the fence line as required, to allow proper installation of the fence.
3. The building up of rocky areas to create “walls” along the bottom of the fence will not be acceptable.

G. Adaptations to Terrain

1. Woven wire will not be deformed to adapt to variations in ground contour. “Belly” and “Droop” are unacceptable.

H. Install mesh according to manufacturer's written instructions.
I. Install fences by setting posts as indicated and fastening mesh and staples to posts.
J. Post Excavation: Drill or hand-excavate holes for posts in firm, undisturbed soil. Excavate holes to a diameter of not less than 4 times post size and a depth as indicated on drawings.
K. Post Setting: Set posts by mechanically driving into soil at indicated spacing into firm soil.

    1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with mechanical devices.

3.5 GATE INSTALLATION

A. Install gates according as indicated on drawings, level, plumb, and secure for full opening without interference. Attach hardware using tamper-resistant or concealed means. Adjust hardware for smooth operation and lubricate where necessary.

3.6 ADJUSTING

A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.
B. Lubricate hardware, and other moving parts.

END OF SECTION

SECTION 33 90 10
PRE-INSULATED ARCTIC PIPE AND FITTINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Water main piping.
2. Sewer vacuum main piping.
3. Sewer gravity service piping.

B. Work Description:
1. The Contractor shall supply insulated pipe and fittings with heat trace channels for use in water and sewage applications.
2. The minimum service temperature range of all individual components and final products shall be -60 to 100°F unless otherwise specified.
3. All pipe and fittings shall be capable of withstanding the cyclic freezing of water under its rated service pressure without breaks, leaks, gross deformities or impaired service characteristics.
4. Arctic pipe and fittings shall consist of an HDPE core pipe insulated with polyurethane insulation and protected with an outer jacket of either aluminum pipe or HDPE, as specified in the Drawings.
5. To the extent practical, insulated pipe should be supplied in continuous 40-foot lengths to reduce the number of pipe joints and joint kits on long runs.

1.2 REFERENCE STANDARDS

A. ASTM International
1. ASTM C177: Thermal transmission (guarded hot-plate apparatus)
2. ASTM C273: Shear properties of sandwich-core materials
3. ASTM C518: Thermal transmission (heat flow meter apparatus)
4. ASTM D1248: Polyethylene (PE) extrusion materials – wire and cable
5. ASTM D1599: Resistance to short-time hydraulic failure pressure of plastic pipe, tubing, and fittings
6. ASTM D1621: Compressive properties of rigid cellular plastics
7. ASTM D1622: Apparent density of rigid cellular plastics
8. ASTM D2126: Response of rigid cellular plastics to thermal humid aging (thermal dimensional stability)
9. ASTM D2657: Heat Joining Polyolefin Pipe and Fittings
10. ASTM D2837: Obtaining pressure design basis for thermoplastic pipe products
11. ASTM D2842: Water absorption of rigid cellular plastics

12. ASTM D3350: Specification for Polyethylene Plastic Pipe and Fittings Materials
13. ASTM E96: Water vapor transmission of rigid cellular plastics
14. ASTM E398: Water vapor transmission rate of sheet materials (dynamic relative humidity measurement)
15. ASTM F714: Polyethylene (PE) plastic pipe (SDR-PR) – based on outside diameter

B. American Water Works Association
   1. AWWA C901: Polyethylene Pressure Pipe and Tubing, 1/2 inches through 3 inches for Water Service
   2. AWWA C906: Polyethylene Pressure Pipe and Fittings, 4 inches through 63 inches for Water Distribution and Transmission

C. National Sanitation Foundation
   1. NSF/ANSI-61: Drinking Water System Components-Health Effects
   2. NSF/ANSI-372: Drinking Water System Components-Lead Content

D. Plastic Pipe Institute
   1. PPI Handbook of Polyethylene Pipe.
   2. PPI TR-3 - Policies and Procedures for Developing Hydrostatic Design Basis (HDB), Hydrostatic Design Stresses (HDS), Pressure Design Basis (PDB), Strength Design Basis (SDB), Minimum Required Strength (MRS) Ratings, and Categorized Required Strength (CRS) for Thermoplastic Piping Materials or Pipe
   3. PPI TR-4 - HDB/HDS/SDB/PDB/MRS Listed Materials.
   4. PPI TR-33 - Generic Butt Fusion Joining Procedure for Field Joining Polyethylene Pipe.

1.3 DEFINITIONS

A. AWWA: American Water Works Association

B. Drawings: Those documents that comprise the construction contract, the Contracting Officer - insulated pipe manufacturer agreement, conditions of the contract (general, supplementary, and other conditions), plans and/or drawings, specifications, all addenda, modifications, and changes thereto, together with any other items stipulated as being specifically included.

C. Core Pipe: Inner pipe for transmitting product.

D. Pipe Jacket: Outer pipe that protects insulation.

E. Heat Trace Channel: Conduit(s) placed adjacent to the core pipe for heat addition.

F. HDPE: High Density Polyethylene

G. IPS: Iron Pipe Size

H. NPS: Nominal Pipe Size

I. NSF: National Sanitation Foundation

J. PE: Polyethylene

K. PPI: Plastic Pipe Institute

L. PSI: Pounds per square inch

M. SDR: Standard Dimension Ratio

1.4 SUBMITTALS

A. See Specification Section 01 30 00 – Submittal Requirements for requirements for the mechanics and administration of the submittal process. Required submittals described in this specification include the following.

B. Manufacturer's shop drawings for each size of fully constructed insulated pipe and each size/style of fitting indicating compliance with this Section. Shop drawings shall include the following minimum information:
   1. Overall length of insulated pipe in feet and inches measured from end to end along the longitudinal axis;
   2. Overall fitting dimensions in feet and inches measured from core pipe centerline. Fittings require a minimum of two linear measurements and one angular measurement;
   3. Fully constructed insulated pipe cross sections with dimensions showing locations relative to the centroid of the composite pipe for the core pipe, heat trace channel (glycol or electric), and metal outer jacket;
   4. HDPE core pipe inner and outer diameter, SDR, and material designation code;
   5. HDPE electric heat trace channel pipe inner and outer diameter, SDR, and material designation code;
   6. HDPE glycol heat trace channel pipe inner and outer diameter, SDR, and material designation code;
   7. Metal outer jacket alloy material, thickness, corrugation spacing, and corrugation depth (if applicable);
   8. HDPE core pipe stub-out length past end of insulation and outer jacket;
   9. HDPE heat trace channel stub-out length past end of insulation and outer jacket;
   10. Dry film thickness of the coating to be applied to the insulation faces.

C. Manufacturer's Literature for:
   1. HDPE core pipe, electric heat trace, and glycol heat trace channel;
   2. Aluminum outer jacket materials and method of fabrication;
   3. Urethane insulation – product data must clearly show the proposed insulation meets the requirements of this Section;
   4. Embedded fittings; and Insulation sealants.

D. Test Reports: Provide the following test reports at the frequencies required in the Delivery Order. Third-party reports are required for Destructive Test samples:
   1. Report of Visual Inspection;
   2. K Factor;
   3. Minimum Compressive Strength;
   4. Insulation adhesion bond; and
   5. Fusion logs for all fitting fusion joints
      a. Fusion machine model
      b. Pressure
      c. Temperature
      d. Duration (hold time and cool-down time)
      e. Project location/station number
      f. Date
      g. Time
      h. Staff conducting the work
   6. Pressure test results for all internal fittings.

1.5 QUALITY ASSURANCE

A. Insulated Pipe and Fitting Manufacturer:
   1. Company specializing in manufacturing products specified in this section shall have a minimum ten years of experience fabricating comparable insulated pipe and fittings.
   2. HDPE fusion procedures and qualifications: Insulated Pipe Manufacturer's weld procedures shall be provided for review; and shall be in strict accordance with pipe manufacturer's requirements for butt fusion welding of HDPE pipe. The individual who performs the butt-fusion shall have written certification from an HDPE pipe manufacturer stating he/she has successfully completed an 8-hour (minimum) certification class on butt-fusion techniques and procedures. In addition, this individual shall have fused a combined total of more than 5,000 feet of HDPE piping in diameters 4-inches and larger.

B. HDPE Pipe Manufacturer:
   1. The HDPE manufacturer shall have an established quality control program responsible for inspecting incoming and out-going materials.

Incoming polyethylene materials shall be inspected for density, melt flow rate, and contamination. The Manufacturer shall certify the cell classification properties of incoming material and certify the inspection and testing of materials. Incoming materials shall be approved by Quality Control before processing into finished goods.

2. Manufacturer shall be ISO 9001 certified.
3. PE materials: All incoming lots of PE materials shall be sampled and tested for melt-flow index and density by the pipe manufacturer.
4. Manufacturer shall demonstrate their manufacturing facility is third party certified in accordance with NSF Standard 61.

C. Engineer shall have open access to the fabrication facility and any sub-tier suppliers to assure conformance with the Specifications and quality of workmanship.

D. Any deficiency found in a segment of pipe shall be cause for rejection of the entire segment of pipe. All rejected pipe shall be replaced by the Contractor at no additional cost to the Owner.

E. All insulated pipe and fittings supplied under this Specification shall utilize the same manufacturer of core pipe. Contractor shall identify the core pipe manufacturer with his submittal.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All pipe, fittings, valves and appurtenances in contact with potable water shall be lead-free and certified for use in potable water systems per the current version of ANSI/NSF Standard 61.

B. The minimum service temperature range of all individual components and final manufactured products shall be -60 to 100°F unless otherwise specified. The pipe and fittings shall consist of an HDPE SDR 17 core pipe insulated with polyurethane insulation and protected with an outer aluminum jacket.

2.2 CORE PIPE

A. Core HDPE pipe shall be made from material having a minimum material designation code of PE4710. The material shall meet the requirements of ASTM D3350 and shall have a minimum cell classification of 445574. Polyethylene pipe and fitting material compound shall contain color and ultraviolet (UV) stabilizer meeting or exceeding the requirements of Code C per ASTM D3350. All PE4710 pipe shall be manufactured from a bimodal resin. The pipe shall meet the requirements of AWWA C901 and C906 and be listed in PPI TR-4. Core HDPE pipe shall be marked in accordance with the standards to which it is manufactured.

B. Unless otherwise noted herein or on the drawings, all fittings shall be constructed utilizing core pipe of the same manufacturer, material, resin, and dimensions as that used for the core pipe of the straight lengths.

C. All core HDPE pipe and fittings shall conform to standard iron pipe size outside dimensions (IPS), have a wall thickness meeting SDR 17, and have a minimum pressure rating of 125 psi per AWWA C901 at 80 °F.

D. All HDPE pipe shall be from straight sticks of pipe. Under no circumstances shall any coiled HDPE pipe be used to manufacture products furnished under this specification. All core pipe shall be black and stamped with the appropriate SDR and ASTM designations.

E. All core HDPE pipe and fittings shall be homogeneous throughout, free of visible cracks, holes, foreign inclusions, blisters, dents, or other injurious defects, and shall be made of materials having the same chemical and physical characteristics. All HDPE pipe ends shall be free from chips, gouges, and other damage.

F. All core HDPE fittings shall be manufactured to be as strong as or stronger than the pipe the fittings will be joined to, and shall maintain identical IPS outside-dimension on stub-outs, and shall conform to the minimum pressure rating listed in Section 2.2 C. Tees may be fabricated using branch saddle sidewall fusion or molded fittings. All wyes shall be constructed using a prefabricated reinforced fitting constructed with thickened sidewalls and an inside diameter that matches SDR 17 pipe.

G. HDPE pipe and fittings shall be designed for direct pipe-to-pipe or pipe-to-fitting thermal butt fusion or for push-on type sewer couplings as specified on the Drawings.

H. Push-On Type Sewer Couplings

1. Bell ends of all core pipe and fittings shall be fabricated with identical PVC push-on type sewer couplings. All PVC sewer couplings shall be manufactured in one piece of injection molded PVC compound meeting ASTM D1784. Couplings shall be Class 200 and conform to requirements of DR 21. Fittings shall be designed to withstand a minimum of 630 psi quick burst pressure at 73°F, tested in accordance with ASTM D1599. Bells shall be gasketed joints conforming to ASTM D3139 with gaskets conforming to ASTM F477.
2. The gaskets on push-on couplings shall be elastomeric, non-circular in cross-section, tapered on the inlet edge to prevent rollout when the pipe is coupled, and be not less than 1/4-inch square in the cross-sectional area. The groove in which the gasket is retained shall have sides that are perpendicular to the center line of the pipe.
3. The spigot end of the core pipe shall be smoothly beveled to a 15 degree

angle as shown in the drawings. The bevel shall reduce the wall thickness at the end of the pipe by 50 percent. The bell and spigot ends shall be free from chips, gouges, and other damage. The bell couplings shall not be ground, chipped, gouged, or damaged in any manner.

I. HDPE Fittings: HDPE (core pipe) fittings shall be manufactured to be as strong as or stronger than the pipe to which the fittings will be joined, shall maintain identical IPS outside dimension on stub-outs, and shall conform to the minimum pressure rating listed above.
   1. Fittings shall be manufactured from NSF/ANSI-61-certified components.
   2. Wyes shall be constructed using a prefabricated reinforced fitting constructed with thickened sidewalls and an inside diameter that matches SDR 11 or SDR 17 pipe.
   3. HDPE fittings shall have a PPI-recommended HDB of 160 psi at a temperature of 73.4°F. No pressure de-ratings shall be allowed unless explicitly allowed by the ENGINEER.

J. HDPE Elbows: HPDE (core pipe) elbows between 2 and 8 inches in diameter shall be fabricated using sweep bends.
   1. Sweep bends shall be seamless, manufactured in one continuous piece of SDR 11 or SDR 17 HDPE pipe, with an angular tolerance of + 2 degrees without reversion and shall have a bend radius as specified in the following table.
   2. Elbows shall not be mitered and fused.
   3. Elbows shall maintain normal outside diameters along their entire length within tolerance as per ASTM F714 and be suitable for butt-welding or electrofusion.
   4. The outside surface of the elbows shall exhibit all the specified characteristics of the straight pipe and shall not have any blisters or other surface defects from the manufacturing process.
   5. Sweep bends shall be NSF/ANSI-61 certified after manufacture of the final product.
   6. Tight-radius 90-degree elbows shall be constructed with molded fittings rated at the minimum pressure listed in Article 2.01C above, and shall be NSF/ANSI-61 certified.
   7. HDPE sweep fittings shall have a PPI-recommended HDB of 160 psi at a temperature of 73°F. No pressure de-ratings shall be allowed unless explicitly allowed by the Engineer.

K. The manufacturer of fabricated fittings supplied under this Specification shall establish and qualify heat fusion procedures conforming to PPI TR-33 and ASTM D2657. Fusion shall be performed by a factory-certified operator qualified in the use of the specific equipment employed to construct the fittings.

2.3 PIPE IDENTIFICATION

A. The following shall be continuously indent printed on the pipe or spaced at intervals not exceeding 5-feet.
   1. Name and/or trademark of the pipe manufacturer.
   2. Nominal pipe size.
   3. Dimension ratio.
   4. The letters PE followed by the polyethylene grade in accordance with ASTM D1248 followed by the hydrostatic design basis of the piping.
   5. A production code from which the date and place of manufacture can be determined.

2.4 METAL OUTER JACKET

A. Metal outer jackets for pipe and fittings shall be constructed of 16-gauge (0.063 inch thick) internal helical lock-seam corrugated aluminum pipe with nominal diameters as indicated on the Drawings.
   1. Aluminum alloy material shall be 3004-H34 with a 7072 coating on the outside of the jacket or 5052-H32.
   2. All helical seams shall be continuous, tightly locked and folded. The outer jacket of all pipe and fittings shall be watertight under a five-foot head of water.

B. Outer jacket corrugations shall be between 3/16 inches and 3/8 inches deep, as measured from the flat area between corrugations to the bottom of the corrugation on the outside of the jacket. Corrugations shall be spaced no more than 2-2/3 inches apart and formed diagonally around the pipe, resulting in not less than 2 nor more than 10 complete corrugations crossing the pipe's circumference at a given cross section.

C. The nominal diameter shall be the inside diameter as measured between the innermost portion of the corrugations, with a dimensional tolerance of +1/2 inches.

D. All joints in the aluminum outer jacket fabricated around fittings shall be push-on type, welded with a continuous bead, resulting in a finished jacket that is watertight per the requirements of Article 2.2A above.

E. The Contractor shall provide the manufacturer's name and production date (month and year) on the outer jacket of each pipe and fitting. Information shall be engraved on aluminum jackets with 1/8-inch to ¼-inch high lettering within 24 inches of one end of the jacket.

F. All surfaces of the outer jacket, including end-cuts and welds, shall be finished such that no jagged edges exist that could cause personal injury.

G. The interior of the jacket shall be free of oils, grease, or other residue that

could interfere with the adhesion of insulation to the outer jacket.

2.5 HDPE OUTER JACKET – NOT USED

2.6 INSULATION

A. Urethane insulation shall exhibit the following properties and characteristics specified by the referenced ASTM tests below.

ASTM C518 or C177	Maximum K-factor, as produced	0.155 btu-in/hr-SF-°F
ASTM C518 or C177	Maximum K-factor, aged 7 days	0.170 btu-in/hr-SF-°F
ASTM D1622	Density	>2.0 lbs/ft^3
ASTM D1621	Minimum Compressive Strength	35 psi
ASTM D2842	Maximum Water Absorption	0.5% by volume
ASTM D2126	Dimensional Stability (Maximum Linear change)	1% at -40°F 3% at +100°F

B. Exposed urethane insulation faces at pipe and fitting ends shall be coated to protect against physical abuse, UV exposure during shipping and storage, and against water intrusion in service.
   1. The coating shall be suitable for direct application over urethane insulation with no deleterious effects to the insulation or coating.
   2. The coating shall be formulated for long-term service and retained flexibility over extended periods of exposure to sunlight, harsh weather, and saltwater spray.
   3. The strength of the adhesive bond of the coating to the insulation shall be greater than the tensile strength of the coating. In the event the coating is nicked or an edge is rolled up in handling, the coating that has been dislodged shall tear free from the coating still adhering to the insulation rather than pull the balance of the coating off as a sheet.
   4. The coating shall be applied and cured in strict accordance with the manufacturer's recommendations and good commercial practice such that the finished product is free of defects affecting its intended purpose.
   5. The coating material shall exhibit the following properties and characteristics:

ASTM E398 or E96	Maximum Water Vapor Permeance	1.0 perm
	Dry Film Thickness Range:	50 to 75 mils

2.7 HEAT TRACE CHANNELS

A. Heat trace channels shall be fully enclosed and constructed of PE or ABS material with a minimum thickness of 0.10 inches. The channel shall be in direct contact with the core pipe for its entire length and there shall be no intrusion of insulation between the channel and the core pipe unless otherwise specified.

B. Electric heat trace channels shall be taped to the core pipe with aluminum tape. The channels shall be taped to the core pipe continuously throughout the insulated portion of the pipe. The tape shall make contact with at least one inch of the core pipe on either side of the electric heat trace channel. Tape shall be 3M #3311 aluminum foil tape or approved equal.

2.8 FLANGES AND ACCESSORIES

A. Connection:
   1. Type 304, stainless steel backup ring with 125 lb. ANSI B16.1 standard drilling. Flanges shall be completed with one-piece, molded polyethylene stub ends.
   2. Flanged connections shall have the same pressure rating as the pipe or greater.

B. Gaskets: Flat ring, full face, 1/8-inch EPDM.

C. Bolts:
   1. Type 304 stainless steel hex-head bolts; and hex-head nuts.
   2. Bolts shall be fabricated in accordance with ANSI B18.2 and provided with washers of the same material as the bolts.

2.9 GRAVITY SEWER CLEANOUT

A. Construct with arctic pipe as detailed in the Drawings.

B. Pipe and fittings used in the construction of sanitary sewer cleanouts shall be of the same material used for sewer main construction or as shown on the Drawings.

C. End Cap: Fernco Quick Cap, or approved equal, with stainless steel clamp, matching the core pipe diameter.

D. Provide insulated sewer cleanout cap as detailed in the Drawings.
E. Install cleanouts at locations and elevations per the Drawings.

2.10 SEWER SERVICE

A. Service connections shall be a sanitary wye, tee, or service saddle. Sewer service saddles shall be as required by the Drawings or an

approved equal.

PART 3 - EXECUTION

3.1 MANUFACTURING AND DIMENSIONAL TOLERANCES

A. Allowable offset of the outer jacket centerline and core pipe shall be not more than 1/4-inch at the pipe ends. Elsewhere along pipe lengths the centerline offset shall not be greater than 3/8- inch. Allowable offset of the electric heat trace channel and core pipe shall be not more than 3/8-inches.

B. The minimum temperature of all components used to manufacture pipe and fittings shall be 50°F at the start of fabrication. The fabricated pipe shall be placed in a facility maintained at a temperature of 50 °F or greater for a minimum of 12 hours after fabrication.

C. All elbows shall have a radius as specified in the drawings with a tolerance of ± 2 degrees.

D. All branches of fabricated fittings must lie in a single plane with a maximum deviation of ± 2 degrees.

E. The spigot end of the core pipe shall extend beyond the face the insulation a distance of 1-3/4- inches plus the insertion depth of the push-on coupling + 1/4-inch. The insertion depth shall be defined as the distance between the outside edge of the coupling and the coupling center stop.

F. The outer jacket shall be cut in one pass perpendicular to the length of the jacket + 1 degree. The coupling on bell ends shall be perpendicular to the length of the jacket + 1 degree and flush with the jacket end with a tolerance of -1/8-inch. No part of the coupling shall protrude beyond the end of the jacket as determined by placing a straight-edge across the jacket at any two points. The bell end of the coupling shall be flush with the insulation and outer jacket. Before coating, the plane of the exposed insulation face at bell and spigot ends shall be perpendicular to the centerline axis of the outer jacket + 1/8-inch. The insulation profile of the coated ends shall not exceed a relief deviance of + 1/4-inch across the face.

3.2 LABELING

A. The manufacturer’s name and production date (day/month/year) shall be embossed on the outer jacket of each pipe and fitting.

3.3 FABRICATED FITTINGS

A. Fusion joints used in fabricated fittings shall be documented by a computer that records pressure and temperature applied at each fused joint. Computer

printouts and electronic data for each fitting shall be made available to the Engineer upon request. Contractor shall ensure that each joint is fused at the temperature and pressure recommended by the pipe manufacturer in order to achieve the maximum pressure rating for that joint.

B. All fittings for each project shall be labeled with a unique identifier that corresponds with the fusion computer printouts for each fitting.

C. All fabricated fittings shall have all inside fusion beads removed in such a manner as to result in a continuously smooth flow path inside the pipe per the requirements of the International Plumbing Code Section 704.2 and 706.2, and the Alaska Department of Environmental Conservation 18 AAC 72.040(b)(4)(C).

3.4 INSULATING

A. All Federal and State regulations applicable to the type of insulation and its use shall be strictly adhered to.

B. Insulation shall be placed into the pipe by a single injection application. Fittings may be manufactured using one insulation injection for each open end of the fitting. In no case shall the jacket be drilled to perform, monitor, or inspect the injection.

C. Maximum allowable void size is 0.05 in^3 (for reference, a 3/8-inch x 3/8-inch x 3/8-inch cube is 0.05 in^3).

D. Insulation and chemicals shall be prevented from coming in contact with the end or inside of the exposed core pipe.

E. The heat trace channel shall be secured to the outside of the core pipe, parallel to the pipe axis, and prior to insulating. The channel shall protrude 2 inches past the insulation faces at each end of the pipe or fitting, be free of insulation residue and foreign substances, and open to the minimum cross section specified throughout.

3.5 CORE PIPE/INSULATION BOND

A. Core pipe and fittings shall be bonded to the insulation with minimum shear bond strength of 15 psi, or in such a manner as to produce insulation-to-insulation separation when a sample is tested in shear.

B. The core pipe surface preparation will be performed in a manner that does not leave foreign material imbedded in the plastic. Gouges or scratches in the pipe surface that exceed the tolerance specified by the pipe manufacturer for the pipe pressure rating shall be cause for rejection.

3.6 PRODUCTION TESTING AND INSPECTION

A. Only finished pipe lengths and fittings that meet the requirements of these Specifications and Drawings shall be used for destructive testing. Should any product fail to meet the visual quality control specifications listed below, that product shall be either re-built to meet the Specifications or rejected. Only those products that meet all visual quality control specifications shall be considered final products suitable for receipt by the Owner or for laboratory or other destructive testing.

1. Continuous Visual Quality Control:
   a. Fusion Joints: All fusion joints on elbow and fitting extensions shall be examined before the core pipe assembly is installed into the outer jacket. Elbow and fitting extension fusion joints shall meet all the requirements of the pipe manufacturer and the following minimum requirements:
      1) On both sides, the double bead shall be rolled over to the surface and be uniformly rounded and consistent in size throughout the entire circumference of the joint.
      2) The gap between the two beads shall not be below the fusion surface throughout the entire circumference of the joint.
      3) The displacement (perpendicular to the pipe centerline) between the fused ends shall not exceed 10% of the pipe minimum wall thickness.
      4) The width of the combined two beads for SDR 11 pipe shall be as follows:

Pipe Diam.	Minimum Bead Width	Maximum Bead Width
2” pipe	3/16 inches	5/16 inches
3” pipe	9/32 inches	3/8 inches
4” pipe	5/16 inches	7/16 inches
6” pipe	3/8 inches	9/16 inches
8” pipe	1/2 inches	11/16 inches

      5) Both beads of each fusion joint shall be of a uniform size and shape. The ratio of the difference in individual bead widths divided by the total width of both beads shall not exceed 10%.
   b. Dimensional Tolerance: Each length of pipe and each fitting will be examined by the Contractor for off-set tolerances, insulation cut-back distances, exposed insulation face alignment and relief profile, and alignment and smoothness of core pipe ends.
   c. Insulation Integrity: Completed pipe and fitting ends shall be inspected for voids in excess of 0.05 in^3 or discontinuities by the Contractor prior to coating. Any glazing left on the uncoated pipe end from the forms used during the insulating operation shall be removed

before coating.

d. HDPE Carrier Pipe: The surface of the HDPE carrier pipe shall be free of nicks, cuts, or gouges as outlined in paragraph 2.1 of this document.

2. Testing: On a daily basis, for every 200 LF of arctic pipe manufactured, testing as identified in approved hydrostatic testing procedure shall be conducted to verify the quality of the finished product, and recorded:
   a. The density and K-factor shall be measured on insulation specimens of the appropriate size and under the specified conditions as set forth in the applicable ASTM test. For these tests, insulation specimens shall be retrieved by cutting a 12- inch section of insulated pipe from a production sample. The remaining length shall be trimmed to the dimensional tolerances of this Specification to allow Owner use of that pipe section.
   b. Should the Contractor choose to test the "K" factor as outlined in ASTM C518, the testing apparatus shall be calibrated within 24 hours of the test using a calibration standard certified accurate by the National Bureau of Standards (NBS). The "K" factor test sample shall be removed from the insulated pipe, prepared for testing, and left open to the atmosphere at 70°F for a minimum of 24 hours prior to testing.
   c. Each embedded core pipe fusion joint shall be pressure tested to 125 psi in accordance with the following standard:
      1) ASTM F1417 – Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low Pressure Air
   d. In addition to the testing identified in Article 2.02B, and at no additional cost to the Owner, the following laboratory tests shall be performed on every 480 LF of manufactured pipe to verify the quality of the finished product:
      1) Core pipe/insulation bond:
         a) Two 6-inch lengths of cured insulated pipe shall be cut from one uncoated insulation face end of completed pipe length. The remaining length shall be trimmed according to the dimensional tolerances of this Specification and coated to allow Owner use of that pipe section.
         b) One specimen shall be tested at +70°F. The other specimen shall be brought to -60°F in 4 hours or less, and remain there for at least 24 hours before testing. Acceptance will be indicated by a minimum shear bond strength of 15 psi and insulation-to-insulation (or insulation-to-insulation pipe surface film) separation or tearing.

3.7 PACKING

A. The core pipe spigot ends of all pipe and fittings shall be capped with PE pipe caps (Caplugs, or approved equal) and the plugs taped to the pipe with black electrical tape (such as 3M #33+) or other approved tape after final inspection and prior to shipment. Duct tape shall not be used to secure the PE pipe caps to the pipe spigot ends.

B. Pre-insulated pipe shall be packed in bundles with a maximum gross weight of 3,000 pounds per bundle unless otherwise specified by the Owner.
   1. The end geometry of each bundle shall be rectangular.
   2. Each layer of pipe within the bundle including the bottom layer shall rest upon a minimum of 3 each 4-inch x 4-inch cross cleats banded to that individual layer using 1 1/4-inch steel strapping.
   3. All cleats shall feature a 45-degree stop block at least nominal 4 inches high by 4 inches long fastened securely to both ends of the cleats to prevent the pipe from rolling off the cleat when the banding is cut.
   4. The outer cross cleats shall be installed between 1 to 2 feet from the insulation face of the pipe ends with the middle cleat centered on the bundle. In addition, 1 1/4-inch steel straps shall securely fasten all the layers together to form a complete bundle.

C. Fittings and couplings shall be packaged in crates sheathed with minimum 1/2-inch sheathing not to exceed 4 ft x 4 ft x 8 ft.
   1. Minimum nominal 2-inch x 3-inch framing members shall be installed in all corners of the crate and fastened securely to the sheathing.
   2. On crates longer than 6 feet, framing members shall be installed along the shorter centerline of all the 4 long panels. The framing members shall be securely fastened to each other and to the sheathing.
   3. For crates 4 feet long or less, 2 each, 4-inch x 4-inch cleats shall be installed on the bottom edges of the crate to provide for forklift handling.
   4. For crates longer than 4 feet, 3 cleats shall be installed, with the middle cleat centered on the crate. These cleats shall be fastened through the bottom sheathing and also banded to the crate with 1 1/4-inch wide steel bands that wrap around the entire crate.
   5. Crates shall be designed to stack 3 crates high and protect contents during rough ocean conditions, air freight transport, and on-site handling without damage.

D. All bundles and crates shall be clearly marked with the following information:

CITY OF SAVOONGA,
REINDEER PROCESSING
FACILITY
“Contractors Name”

3.8 INSPECTION

A. After completion of the quantity of pipe and fittings contracted for, the Owner may perform a final inspection at the fabrication point. The certified results of all required laboratory tests made during production by the Contractor shall be made available in report form at this time.

B. During the final inspection, the product packing will be inspected to see that all requirements listed above have been met. Should any of the packing fail to meet the Specifications, the Contractor shall re-pack the pipe to meet the Specifications.

3.9 INSTALLATION

A. Methods:
1. Install and cut HDPE pipe in accordance with ASTM D2657, thermal butt-fusion, and in strict conformance with the manufacturer's recommendations.
2. Contractor may install piping in pre-manufactured sub-assemblies of any length and configuration that can be safely handled without damaging the piping or endangering personnel.

B. Butt Fusion Jointing:
1. Perform butt fusion in accordance with the procedures established by the pipe manufacturer
2. Perform butt fusion joining of pipe and fittings on fusion machinery approved by the pipe manufacturer.
3. Fusion pressures, temperatures and cycle times shall be provided according to pipe manufacturer's recommendations.
    a. Fusion processes shall be properly tented, heated and otherwise protected from wind and rain.
    b. Fusion pressures, temperatures and cycle times shall be recorded for every joint, and made available for the Engineer’s review upon request.
4. Do not allow any individual to fuse pipe or fittings unless they are factory-trained and certified in the technique involved.
5. Butt fusion is the preferred method of joining HDPE pipe ends and shall be used where possible. Do not use electrofusion couplings unless specifically shown in the Drawings and approved by the Engineer.

C. Insulation and Jacket Jointing:
1. Fit heat trace channel in place, ensuring that ends are de-barred and square to allow easy passage of the electrical trace.
2. Fit insulation half-shells snugly. Band with strapping to hold tightly in place. Maximum gap in half-shells shall be 1/8-inch.

D. Joint Jacket: Install per manufacturer's recommendations employing a silicone sealant, rated to -60 F, on all seams.

END OF SECTION

Appendix A

US Economic Development Administration (EDA)
Contracting Provisions for Construction Projects

OMB Number: 0610-0096
Expiration Date: 01/31/2025

U. S. DEPARTMENT OF COMMERCE
ECONOMIC DEVELOPMENT ADMINISTRATION

EDA CONTRACTING PROVISIONS
FOR CONSTRUCTION PROJECTS

These EDA Contracting Provisions for Construction Projects (EDA Contracting Provisions) are intended for use by recipients receiving federal assistance from the U. S. Department of Commerce - Economic Development Administration (EDA). They contain provisions specific to EDA and other federal provisions not normally found in non-federal contract documents. The requirements contained herein must be incorporated into all construction contracts and subcontracts funded wholly or in part with federal assistance from EDA.

TABLE OF CONTENTS

1. DEFINITIONS

Agreement – The written instrument that is evidence of the agreement between the Owner and the Contractor overseeing the Work.

Architect/Engineer - The person or other entity engaged by the Recipient to perform architectural, engineering, design, and other services related to the work as provided for in the contract.

Contract – The entire and integrated written agreement between the Owner and the Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

Contract Documents – Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents.

Contractor – The individual or entity with whom the Owner has entered into the Agreement.

Drawings or Plans – That part of the Contract Documents prepared or approved by the Architect/Engineer that graphically shows the scope, extent, and character of the Work to be performed by the Contractor.

EDA - The United States of America acting through the Economic Development Administration of the U.S. Department of Commerce or any other person designated to act on its behalf. EDA has agreed to provide financial assistance to the Owner, which includes assistance in financing the Work to be performed under this Contract. Notwithstanding EDA's role, nothing in this Contract shall be construed to create any contractual relationship between the Contractor and EDA.

Owner – The individual or entity with whom the Contractor has entered into the Agreement and for whom the Work is to be performed.

Project – The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.

Recipient – A non-Federal entity receiving a Federal financial assistance award directly from EDA to carry out an activity under an EDA program, including any EDA-approved successor to the entity.

Specifications – That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.

Subcontractor – An individual or entity having direct contract with the Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.

Work – The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.

2. APPLICABILITY

The Project to which the construction work covered by this Contract pertains is being assisted by the United States of America through federal assistance provided by the U.S. Department of Commerce - Economic Development Administration (EDA). Neither EDA, nor any of its departments, entities, or employees is a party to this Contract. The following EDA Contracting Provisions are included in this Contract and all subcontracts or related instruments pursuant to the provisions applicable to such federal assistance from EDA.

3. FEDERALLY REQUIRED CONTRACT PROVISIONS

(a) All contracts in excess of the simplified acquisition threshold - currently fixed at $150,000 (*see* 41 U.S.C. §§ 134 and 1908) must address administrative, contractual, or legal remedies in instances where contractors violate or breach contract terms, and provide for such sanctions and penalties as may be appropriate.

(b) All contracts in excess of $10,000 must address termination for cause and for convenience by the Recipient including the manner by which it will be effected and the basis for settlement.

(c) All construction contracts awarded in excess of $10,000 by recipients of federal assistance and their contractors or subcontractors shall contain a provision requiring compliance with Executive Order 11246 of September 24, 1965, *Equal Employment Opportunity*, as amended by Executive Order 11375 of October 13, 1967, and Department of Labor implementing regulations at 41 C.F.R. part 60.

(d) All prime construction contracts in excess of $2,000 awarded by Recipients must include a provision for compliance with the Davis-Bacon Act (40 U.S.C. §§ 3141-3148) as supplemented by Department of Labor regulations at 29 C.F.R. part 5. The contracts must also include a provision for compliance with the Copeland "Anti-Kickback" Act (18 U.S.C. § 874 and 40 U.S.C. § 3145) as supplemented by Department of Labor regulations at 29 C.F.R. part 3.

(e) All contracts awarded by the Recipient in excess of $100,000 that involve the employment of mechanics or laborers must include a provision for compliance with 40 U.S.C. §§ 3702 and 3704 (the Contract Work Hours and Safety Standards Act) as supplemented by Department of Labor regulations at 29 C.F.R. part 5.

(f) All contracts must include EDA requirements and regulations that involve a requirement on the contractor or sub-contractor to report information to EDA, the Recipient or any other federal agency.

(g) All contracts must include EDA requirements and regulations pertaining to patent rights with respect to any discovery or invention which arises or is developed in the course of or under such contract.

(h) All contracts must include EDA requirements and regulations pertaining to copyrights and rights in data.

(i) All contracts and subgrants in excess of $150,000 must contain a provision that requires compliance with all applicable standards, orders, or requirements issued under the Clean Air Act (42 U.S.C. § 7401 *et seq.*) and the Federal Water Pollution Control Act (Clean Water Act) (33 U.S.C. § 1251 *et seq.*), and Executive Order 11738, *Providing for Administration of the Clean Air Act and the Federal Water Pollution Control Act With Respect to Federal Contracts, Grants, or Loans*.

(j) Contracts must contain mandatory standards and policies relating to energy efficiency which are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act (42 U.S.C.§ 6201).

(k) Contracts must contain a provision ensuring that contracts are not to be made to parties on the government wide Excluded Parties List System in the System for Award Management (SAM), in accordance with the OMB guidelines at 2 C.F.R. part 180.

(l) Contracts must contain a provision ensure compliance with the Byrd Anti-Lobbying Amendment (31 U.S.C. § 1352) under which contractors that apply or bid for an award of $100,000 or more must file the required certification. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by 31 U.S.C. § 1352. Each tier must also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the non-Federal award.

(m) If the Recipient is a state agency or agency of a political subdivision of a state, any contract awarded must contain a provision ensuring compliance with section 6002 of the Solid Waste Disposal Act (42 U.S.C. § 6962), as amended by the Resource Conservation and Recovery Act related to the procurement of recovered materials.

4. REQUIRED PROVISIONS DEEMED INSERTED

Each and every provision of law and clause required by law to be inserted in this contract shall be deemed to be inserted herein and the contract shall be read and enforced as though it were included herein, and if through mistake or otherwise any such provision is not inserted, or is not correctly inserted, then upon the application of either party the contract shall forthwith be physically amended to make such insertion of correction.

5. INSPECTION BY EDA REPRESENTATIVES

The authorized representatives and agents of EDA shall be permitted to inspect all work, materials, payrolls, personnel records, invoices of materials, and other relevant data and records.

6. EXAMINATION AND RETENTION OF CONTRACTOR'S RECORDS

(a) The Owner, EDA, or the Comptroller General of the United States, or any of their duly authorized representatives shall, generally until three years after final payment under this contract, have access to and the right to examine any of the Contractor's directly pertinent books, documents, papers, or other records involving transactions related to this contract for the purpose of making audit, examination, excerpts, and transcriptions.

(b) The Contractor agrees to include in first-tier subcontracts under this contract a clause substantially the same as paragraph (a) above. "Subcontract," as used in this clause, excludes purchase orders that do not exceed $10,000.

(c) The periods of access and examination in paragraphs (a) and (b) above for records relating to (1) appeals under the disputes clause of this contract, (2) litigation or settlement of claims arising from the performance of this contract, or (3) costs and expenses of this contract to which the Owner, EDA, or Comptroller General or any of their duly authorized representatives has taken exception shall continue until disposition of such appeals, litigation, claims, or exceptions.

7. CONSTRUCTION SCHEDULE AND PERIODIC ESTIMATES

Immediately after execution and delivery of the contract, and before the first partial payment is made, the Contractor shall deliver to the Owner an estimated construction progress schedule in a form satisfactory to the Owner, showing the proposed dates of commencement and completion of each of the various subdivisions of work required under the Contract Documents and the anticipated amount of each monthly payment that will become due to the Contractor in accordance with the progress schedule. The Contractor also shall furnish the Owner (a) a detailed estimate giving a complete breakdown of the contract price and (b) periodic itemized estimates of work done for the purpose of making partial payments thereon. The costs employed in making up any of these schedules will be used only to determine the basis of partial payments and will not be considered as fixing a basis for additions to or deductions from the contract price.

8. CONTRACTOR'S TITLE TO MATERIAL

No materials, supplies, or equipment for the work shall be purchased by the Contractor or by any subcontractor that is subject to any chattel mortgage or under a conditional sale contract or other agreement by which an interest is retained by the seller. The Contractor warrants and guarantees that he/she has good title to all work, materials, and equipment used by him/her in the Work, free and clear of all liens, claims, or encumbrances.

9. INSPECTION AND TESTING OF MATERIALS

All materials and equipment used in the completion of the Work shall be subject to adequate inspection and testing in accordance with accepted standards. The laboratory or inspection agency shall be selected by the Owner. Materials of construction, particularly those upon which the strength and durability of any structure may depend, shall be subject to inspection and testing to establish conformance with specifications and suitability for intended uses.

10. "OR EQUAL" CLAUSE

Whenever a material, article, or piece of equipment is identified in the Contract Documents by reference to manufacturers' or vendors' names, trade names, catalogue numbers, etc., it is intended merely to establish a standard. Any material, article, or equipment of other manufacturers and vendors that will perform adequately the duties imposed by the general design will be considered equally acceptable provided the material, article, or equipment so proposed is, in the opinion of the Architect/Engineer, of equal substance and function. However, such substitution material, article, or equipment shall not be purchased or installed by the Contractor without the Architect/Engineer's written approval.

11. PATENT FEES AND ROYALTIES

(a) Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device that is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Architect/Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by the Owner in the Contract Documents.

(b) To the fullest extent permitted by Laws and Regulations, the Contractor shall indemnify and hold harmless the Owner and the Architect/Engineer, and the officers, directors, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

12. CLAIMS FOR EXTRA COSTS

No claims for extra work or cost shall be allowed unless the same was done in pursuance of a written order from the Architect/Engineer approved by the Owner.

13. CONTRACTORS AND SUBCONTRACTORS INSURANCE

(a) The Contractor shall not commence work under this Contract until the Contractor has obtained all insurance reasonably required by the Owner, nor shall the Contractor allow any subcontractor to commence work on his/her subcontract until the insurance required of the subcontractor has been so obtained and approved.

(b) Types of insurance normally required are:

(1) Workers' Compensation
(2) Contractor's Public Liability and Property Damage
(3) Contractor's Vehicle Liability
(4) Subcontractors' Public Liability, Property Damage and Vehicle Liability
(5) Builder's Risk (Fire and Extended Coverage)

(c) **Scope of Insurance and Special Hazards:** The insurance obtained, which is described above, shall provide adequate protection for the Contractor and his/her subcontractors, respectively, against damage claims that may arise from operations under this contract, whether such operations be by the insured or by anyone directly or indirectly employed by him/her and also against any of the special hazards that may be encountered in the performance of this Contract.

(d) **Proof of Carriage of Insurance:** The Contractor shall furnish the Owner with certificates showing the type, amount, class of operations covered, effective dates, and dates of expiration of applicable insurance policies.

14. CONTRACT SECURITY BONDS

(a) If the amount of this Contract exceeds $150,000, the Contractor shall furnish a performance bond in an amount at least equal to one hundred percent (100%) of the Contract price as security for the faithful performance of this Contract and also a payment bond in an amount equal to one hundred percent (100%) of the Contract price or in a penal sum not less than that prescribed by State, Territorial, or local law, as security for the payment of all persons performing labor on the Work under this Contract and furnishing materials in connection with this Contract. The performance bond and the payment bond may be in one or in separate instruments in accordance with local law. Before final acceptance, each bond must be approved by EDA. If the amount of this Contract does not exceed $150,000, the Owner shall specify the amount of the payment and performance bonds.

(b) All bonds shall be in the form prescribed by the Contract Documents except as otherwise provided in applicable laws or regulations, and shall be executed by such sureties as are named in the current list of *Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies* as published in Treasury Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent must be accompanied by a certified copy of the agent's

authority to act. Surety companies executing the bonds must also be authorized to transact business in the state where the Work is located.

15. **LABOR STANDARDS - DAVIS-BACON AND RELATED ACTS**
(as required by section 602 of PWEDA)

(a) **Minimum Wages**

(1) All laborers and mechanics employed or working upon the site of the Work in the construction or development of the Project will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act at 29 C.F.R. part 3, the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at the time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor, which is attached hereto and made a part hereof, regardless of any contractual relationship that may be alleged to exist between the Contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of 29 C.F.R. § 5.5(a)(1)(iv); also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 C.F.R. § 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein, provided that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates determined under 29 C.F.R. § 5.5(a)(1)(ii) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(2) (i) Any class of laborers or mechanics to be employed under the Contract, but not listed in the wage determination, shall be classified in conformance with the wage determination. EDA shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(A) The work to be performed by the classification requested is not performed by a classification in the wage determination;

(B) The classification is utilized in the area by the construction industry; and

(C) The proposed wage rate, including any bona fide fringe benefits, bears a

reasonable relationship to the wage rates contained in the wage determination.

(ii) If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and EDA or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by EDA or its designee to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, D.C. 20210.

(iii) In the event the Contractor, the laborers or mechanics to be employed in the classification or their representatives, and EDA or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), EDA or its designee shall refer the questions, including the views of all interested parties and the recommendation of EDA or its designee, to the Administrator for determination.

(iv) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(2)(ii) or (iii) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(3) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the Contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(4) If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, provided, that the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(b) **Withholding**

EDA or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the Contractor under this Contract or any other federal contract with the same prime Contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees and helpers, employed by the Contractor or any subcontractor the full amount of wages required by the Contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee or helper employed or working on the site of the Work in the construction or development of the Project, all or part of the wages required by the Contract, EDA or its designee may, after written notice to the Contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations

have ceased. EDA or its designee may, after written notice to the Contractor, disburse such amounts withheld for and on account of the Contractor or subcontractor to the respective employees to whom they are due. The Comptroller General shall make such disbursements in the case of direct Davis-Bacon Act contracts.

(c) **Payrolls and basic records**

(1) Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the Work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the Work in the construction or development of the Project. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 C.F.R. § 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the Contractor shall maintain records which show that the commitment to provide such benefits is enforceable, the plan or program is financially responsible, and the plan or program has been communicated in writing to the laborers or mechanics affected, and provide records that show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(2) (i) For each week in which Contract work is performed, the Contractor shall submit a copy of all payrolls to the Owner for transmission to EDA or its designee. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 C.F.R. part 5.5(a)(3)(i). This information may be submitted in any form desired. Optional Form WH-347 is available for this purpose. It may be purchased from the Superintendent of Documents (Federal Stock Number 029-005-00014-1), U.S. Government Printing Office, Washington, D.C. 20402; or downloaded from the U.S. Department of Labor's website at https://www.dol.gov/whd/forms/wh347.pdf. The prime Contractor is responsible for the submission of copies of payrolls by all subcontractors

(ii) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the Contract and shall certify the following:

(A) That the payroll for the payroll period contains the information required to be maintained under 29 C.F.R. § 5.5(a)(3)(i) and that such information is correct and complete;

(B) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the Contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 C.F.R. part 3; and

(C) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the Contract.

(iii) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 15(c)(2)(ii) of this section.

(iv) The falsification of any of the above certifications may subject the Contractor or subcontractor to civil or criminal prosecution under section 1001 of Title 18 and section 3729 of Title 31 of the U.S. Code.

(3) The Contractor or subcontractor shall make the records required under paragraph 15(c)(1) of this section available for inspection, copying, or transcription by authorized representatives of EDA or its designee or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit the required records or to make them available, EDA or its designee may, after written notice to the Contractor or Owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 C.F.R. § 5.12.

(d) **Apprentices and Trainees**.

(1) **Apprentices**. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training (Bureau), or with a State Apprenticeship Agency recognized by the Bureau, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the Contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any

apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a Contractor is performing construction on a Project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Bureau of Apprenticeship and Training, or a State Apprenticeship Agency recognized by the Bureau, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(2) **Trainees**. Except as provided in 29 C.F.R. § 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program that has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman's hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(3) **Equal employment opportunity**. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity

requirements of Executive Order 11246, *Equal Employment Opportunity*, as amended, and 29 C.F.R. part 30.

(e) **Compliance with Copeland Anti-Kickback Act Requirements**. The Contractor shall comply with the Copeland Anti-Kickback Act (18 U.S.C. § 874 and 40 U.S.C. § 3145) as supplemented by Department of Labor regulations (29 C.F.R. part 3, "Contractors and Subcontractors on Public Buildings or Public Works Financed in Whole or in Part by Loans or Grants of the United States"). The Act provides that the Contractor and any subcontractors shall be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public work, to give up any part of the compensation to which they are otherwise entitled. The Owner shall report all suspected or reported violations to EDA.

(f) **Subcontracts**. The Contractor and any subcontractors will insert in any subcontracts the clauses contained in 29 C.F.R. §§ 5.5(a)(1) through (10) and such other clauses as EDA or its designee may require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime Contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 C.F.R. § 5.5.

(g) **Contract termination; debarment**. The breach of the contract clauses in 29 C.F.R. § 5.5 may be grounds for termination of the contract, and for debarment as a Contractor and a subcontractor as provided in 29 C.F.R. § 5.12.

(h) **Compliance with Davis-Bacon and Related Act Requirements**. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 C.F.R. parts 1, 3, and 5 are herein incorporated by reference in this contract.

(i) **Disputes concerning labor standards**. Disputes arising out of the labor standards provisions of this Contract shall not be subject to the general disputes clause of this Contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 C.F.R. parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and EDA or its designee, the U.S. Department of Labor, or the employees or their representatives.

(j) **Certification of Eligibility**.

(1)By entering into this Contract, the Contractor certifies that neither it nor any person or firm that has an interest in the Contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 C.F.R. § 5.12(a)(1).

(2) No part of this Contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 C.F.R. § 5.12(a)(1).

(3) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. § 1001.

16. LABOR STANDARDS - CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

As used in this paragraph, the terms "laborers" and "mechanics" include watchmen and guards.

(a) **Overtime requirements**. No Contractor or subcontractor contracting for any part of the Contract work, which may require or involve the employment of laborers or mechanics, shall require or permit any such laborer or mechanic in any workweek in which that person is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(b) **Violation; liability for unpaid wages, liquidated damages**. In the event of any violation of the clause set forth in paragraph (a) of this section, the Contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such Contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (a) of this section, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (a) of this section.

(c) **Withholding for unpaid wages and liquidated damages**. EDA or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any monies payable on account of work performed by the Contractor or subcontractor under any such Contract or any other federal contract with the same prime Contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime Contractor such sums as may be determined to be necessary to satisfy any liabilities of such Contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b) of this section.

(d) **Subcontracts**. The Contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraphs (a) through (c) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime Contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (a) through (c) of this section.

17. EQUAL EMPLOYMENT OPPORTUNITY

(a) The Recipient hereby agrees that it will incorporate or cause to be incorporated into any contract for construction work, or modification thereof, as defined in the regulations of the Secretary of Labor at 41 C.F.R. chapter 60, which is paid for in whole or in part with funds obtained from EDA, the following equal opportunity clause:

During the performance of this contract, the Contractor agrees as follows:

(1) The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training including apprenticeship. The Contractor agrees to post in conspicuous places available to employees and applicants for employment notices to be provided setting forth the provisions of this nondiscrimination clause.

(2) The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.

(3) The contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the contractor's legal duty to furnish information.

(4) The Contractor will send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers representatives of the Contractor's commitments hereunder, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(5) The Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965 and of the rules, regulations, and relevant orders of the Secretary of Labor.

(6) The Contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to its books, records, and accounts by EDA and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(7) In the event of the Contractor's noncompliance with the nondiscrimination clauses of

this Contract or with any of the said rules, regulations, or orders, this Contract may be canceled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts or federally-assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation or order of the Secretary of Labor, or as otherwise provided by law.

(8) The Contractor will include the portion of the sentence immediately preceding paragraph 17(a)(1) and the provisions of paragraphs 17(a)(1) through (8) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as EDA or the Secretary of Labor may direct as a means of enforcing such provisions, including sanctions for noncompliance. Provided, however, that in the event the Contractor becomes involved in or is threatened with litigation with a subcontractor or vendor as a result of such direction by EDA or the Secretary of Labor, the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

(9) The Recipient further agrees that it will be bound by the above equal opportunity clause with respect to its own employment practices when it participates in federally-assisted construction work. Provided, however, that if the Recipient so participating is a State or local government, the above equal opportunity clause is not applicable to any agency, instrumentality, or subdivision of such government that does not participate in work on or under the Contract.

(10)The Recipient agrees that it will assist and cooperate actively with EDA and the Secretary of Labor in obtaining the compliance of contractors and subcontractors with the equal opportunity clause and the rules, regulations, and relevant orders of the Secretary of Labor, that it will furnish EDA and the Secretary of Labor such information as they may require for the supervision of such compliance, and that it will otherwise assist EDA in the discharge of the EDA's primary responsibility for securing compliance.

(11) The Recipient further agrees that it will refrain from entering into any contract or contract modification subject to Executive Order 11246 of September 24, 1965, with a Contractor debarred from, or who has not demonstrated eligibility for, Government contracts and federally assisted construction contracts pursuant to the Executive Order and will carry out such sanctions and penalties for violation of the equal opportunity clause as may be imposed upon contractors and subcontractors by EDA or the Secretary of Labor pursuant to Part II, Subpart D of the Executive Order. In addition, the Recipient agrees that if it fails or refuses to comply with these undertakings, EDA may take any or all of the following actions: Cancel, terminate, or suspend in whole or in part this EDA financial assistance; refrain from extending any further assistance to the applicant under the program with respect to which the failure or refund occurred until satisfactory assurance of future compliance has been received from such applicant; and refer the case

to the Department of Justice for appropriate legal proceedings.

(b) Exemptions to Above Equal Opportunity Clause (41 C.F.R. chapter 60):

(1) Contracts and subcontracts not exceeding $10,000 (other than Government bills of lading, and other than contracts and subcontracts with depositories of Federal funds in any amount and with financial institutions which are issuing and paying agents for U.S. savings bonds and savings notes) are exempt. The amount of the Contract, rather than the amount of the federal financial assistance, shall govern in determining the applicability of this exemption.

(2) Except in the case of subcontractors for the performance of construction work at the site of construction, the clause shall not be required to be inserted in subcontracts below the second tier.

(3) Contracts and subcontracts not exceeding $10,000 for standard commercial supplies or raw materials are exempt.

18. **CONTRACTING WITH SMALL, MINORITY AND WOMEN'S BUSINESSES**

(a) If the Contractor intends to let any subcontracts for a portion of the work, the Contractor shall take affirmative steps to assure that small, minority and women's businesses are used when possible as sources of supplies, equipment, construction, and services.

(b) Affirmative steps shall consist of:

(1) Placing qualified small and minority businesses and women's business enterprises on solicitation lists;

(2) Ensuring that small and minority businesses and women's business enterprises are solicited whenever they are potential sources;

(3) Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses and women's business enterprises;

(4) Establishing delivery schedules, where the requirements of the contract permit, which encourage participation by small and minority businesses and women's business enterprises;

(5) Using the services and assistance of the U.S. Small Business Administration, the Minority Business Development Agency of the U.S. Department of Commerce, and State and local governmental small business agencies;

(6) Requiring each party to a subcontract to take the affirmative steps of this section; and

(7) The Contractor is encouraged to procure goods and services from labor surplus area firms.

19. **HEALTH, SAFETY, AND ACCIDENT PREVENTION**

(a) In performing this contract, the Contractor shall:

(1) Ensure that no laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to their health and/or safety as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation;

(2) Protect the lives, health, and safety of other persons;

(3) Prevent damage to property, materials, supplies, and equipment; and

(4) Avoid work interruptions.

(b) For these purposes, the Contractor shall:

(1) Comply with regulations and standards issued by the Secretary of Labor at 29 C.F.R. part 1926. Failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act (40 U.S.C. §§ 3701 – 3708); and

(2) Include the terms of this clause in every subcontract so that such terms will be binding on each subcontractor.

(c) The Contractor shall maintain an accurate record of exposure data on all accidents incident to work performed under this Contract resulting in death, traumatic injury, occupational disease, or damage to property, materials, supplies, or equipment, and shall report this data in the manner prescribed by 29 C.F.R. part 1904.

(d) The Owner shall notify the Contractor of any noncompliance with these requirements and of the corrective action required. This notice, when delivered to the Contractor or the Contractor's representative at the site of the Work, shall be deemed sufficient notice of the noncompliance and corrective action required. After receiving the notice, the Contractor shall immediately take corrective action. If the Contractor fails or refuses to take corrective action promptly, the Owner may issue an order stopping all or part of the Work until satisfactory corrective action has been taken. The Contractor shall not base any claim or request for equitable adjustment for additional time or money on any stop order issued under these circumstances.

(e) The Contractor shall be responsible for its subcontractors' compliance with the provisions of this clause. The Contractor shall take such action with respect to any subcontract as EDA, or the Secretary of Labor shall direct as a means of enforcing such provisions.

20. CONFLICT OF INTEREST AND OTHER PROHIBITED INTERESTS

(a) No official of the Owner who is authorized in such capacity and on behalf of the Owner to negotiate, make, accept, or approve, or to take part in negotiating, making, accepting, or approving any architectural, engineering, inspection, construction or material supply contract or any subcontract in connection with the construction of the Project, shall become directly or indirectly interested personally in this Contract or in any part hereof.

(b) No officer, employee, architect, attorney, engineer, or inspector of or for the Owner who is authorized in such capacity and on behalf of the Owner to exercise any legislative, executive, supervisory or other similar functions in connection with the construction of the Project, shall become directly or indirectly interested personally in this Contract or in any part thereof, any material supply contract, subcontract, insurance contract, or any other contract pertaining to the Project.

(c) The Contractor may not knowingly contract with a supplier or manufacturer if the individual or entity who prepared the Contract Documents has a corporate or financial affiliation with the supplier or manufacturer.

(d) The Owner's officers, employees, or agents shall not engage in the award or administration of this Contract if a conflict of interest, real or apparent, may be involved. Such a conflict may arise when: (i) the employee, officer or agent; (ii) any member of their immediate family; (iii) their partner or (iv) an organization that employs, or is about to employ, any of the above, has a financial interest in the Contractor. The Owner's officers, employees, or agents shall neither solicit nor accept gratuities, favors, or anything of monetary value from the Contractor or subcontractors.

(e) If the Owner finds after a notice and hearing that the Contractor, or any of the Contractor's agents or representatives, offered or gave gratuities (in the form of entertainment, gifts, or otherwise) to any official, employee, or agent of the Owner or EDA in an attempt to secure this Contract or favorable treatment in awarding, amending, or making any determinations related to the performance of this Contract, the Owner may, by written notice to the Contractor, terminate this Contract. The Owner may also pursue other rights and remedies that the law or this Contract provides. However, the existence of the facts on which the Owner bases such findings shall be an issue and may be reviewed in proceedings under the dispute resolution provisions of this Contract.

(f) In the event this Contract is terminated as provided in paragraph (e) of this section, the Owner may pursue the same remedies against the Contractor as it could pursue in the event of a breach of this Contract by the Contractor. As a penalty, in addition to any other damages to which it may be entitled by law, the Owner may pursue exemplary damages in an amount (as determined by the Owner) which shall not be less than three nor more than ten times the costs the Contractor incurs in providing any such gratuities to any such officer or employee.

21. RESTRICTIONS ON LOBBYING

(a) This Contract, or subcontract is subject to 31 U.S.C. § 1352, regarding lobbying restrictions. The section is explained in the common rule, 15 C.F.R. part 28 (55 FR 6736-6748, February 26, 1990). Each bidder under this Contract or subcontract is generally prohibited from using federal funds for lobbying the Executive or Legislative Branches of the Federal Government in connection with this EDA Award.

(b) **Contract Clause Threshold**: This Contract Clause regarding lobbying must be included in each bid for a contract or subcontract exceeding $100,000 of federal funds at any tier under the EDA Award.

(c) **Certification and Disclosure**: Each bidder of a contract or subcontract exceeding $100,000 of federal funds at any tier under the federal Award must file Form CD-512, *Certification Regarding Lobbying – Lower Tier Covered Transactions*, and, if applicable, Standard Form-LLL, *Disclosure of Lobbying Activities*, regarding the use of any nonfederal funds for lobbying. Certifications shall be retained by the Contractor or subcontractor at the next higher tier. All disclosure forms, however, shall be forwarded from tier to tier until received by the Recipient of the EDA Award, who shall forward all disclosure forms to EDA.

(d) **Continuing Disclosure Requirement**: Each Contractor or subcontractor that is subject to the Certification and Disclosure provision of this Contract Clause is required to file a disclosure form at the end of each calendar quarter in which there occurs any event that requires disclosure or that materially affects the accuracy of the information contained in any disclosure form previously filed by such person. Disclosure forms shall be forwarded from tier to tier until received by the Recipient of the EDA Award, who shall forward all disclosure forms to EDA.

(e) **Indian Tribes, Tribal Organizations, or Other Indian Organizations**: Indian tribes, tribal organizations, or any other Indian organizations, including Alaskan Native organizations, are excluded from the above lobbying restrictions and reporting requirements, but only with respect to expenditures that are by such tribes or organizations for lobbying activities permitted by other federal law. An Indian tribe or organization that is seeking an exclusion from Certification and Disclosure requirements must provide EDA with the citation of the provision or provisions of federal law upon which it relies to conduct lobbying activities that would otherwise be subject to the prohibitions in and to the Certification and Disclosure requirements of 31 U.S.C. § 1352, preferably through an attorney's opinion. Note, also, that a non-Indian subrecipient, contractor, or subcontractor under an award to an Indian tribe, for example, is subject to the restrictions and reporting requirements.

22. HISTORICAL AND ARCHAEOLOGICAL DATA PRESERVATION

The Contractor agrees to facilitate the preservation and enhancement of structures and objects of historical, architectural or archaeological significance and when such items are found and/or unearthed during the course of project construction. Any excavation by the Contractor that uncovers an historical or archaeological artifact shall be immediately reported to the Owner and a representative of EDA. Construction shall be temporarily halted pending the notification process and further directions issued by EDA after consultation with the State Historic

Preservation Officer (SHPO) for recovery of the items. *See* the National Historic Preservation Act of 1966 (54 U.S.C. § 300101 *et seq.*, formerly at 16 U.S.C. § 470 *et seq.*) and Executive Order No. 11593 of May 31, 1971.

23. **CLEAN AIR AND WATER**

Applicable to Contracts in Excess of $150,000

(a) **Definition**. "Facility" means any building, plant, installation, structure, mine, vessel, or other floating craft, location, or site of operations, owned, leased, or supervised by the Contractor or any subcontractor, used in the performance of the Contract or any subcontract. When a location or site of operations includes more than one building, plant, installation, or structure, the entire location or site shall be deemed a facility except when the Administrator, or a designee, of the United States Environmental Protection Agency (EPA) determines that independent facilities are collocated in one geographical area.

(b) In compliance with regulations issued by the EPA, 2 C.F.R. part 1532, pursuant to the Clean Air Act, as amended (42 U.S.C. § 7401 *et seq.*); the Federal Water Pollution Control Act, as amended (33 U.S.C. § 1251 *et seq.*); and Executive Order 11738, the Contractor agrees to:

(1) Not utilize any facility in the performance of this contract or any subcontract which is listed on the Excluded Parties List System, part of the System for Award Management (SAM), pursuant to 2 C.F.R. part 1532 for the duration of time that the facility remains on the list;

(2) Promptly notify the Owner if a facility the Contractor intends to use in the performance of this contract is on the Excluded Parties List System or the Contractor knows that it has been recommended to be placed on the List;

(3) Comply with all requirements of the Clean Air Act and the Federal Water Pollution Control Act, including the requirements of section 114 of the Clean Air Act and section 308 of the Federal Water Pollution Control Act, and all applicable clean air and clean water standards; and

(4) Include or cause to be included the provisions of this clause in every subcontract and take such action as EDA may direct as a means of enforcing such provisions.

24. **USE OF LEAD-BASED PAINTS ON RESIDENTIAL STRUCTURES**

(a) If the work under this Contract involves construction or rehabilitation of residential structures over $5,000, the Contractor shall comply with the Lead-based Paint Poisoning Prevention Act (42 U.S.C. § 4831). The Contractor shall assure that paint or other surface coatings used in a residential property does not contain lead equal to or in excess of 1.0 milligram per square centimeter or 0.5 percent by weight or 5,000 parts per million (ppm) by weight. For purposes of this section, "residential property" means a dwelling unit, common areas, building exterior surfaces, and any surrounding land, including outbuildings, fences and play equipment affixed to the land, belonging to an owner and available for use by residents, but not

including land used for agricultural, commercial, industrial or other non-residential purposes, and not including paint on the pavement of parking lots, garages, or roadways.

(b) As a condition to receiving assistance under PWEDA, recipients shall assure that the restriction against the use of lead-based paint is included in all contracts and subcontracts involving the use of federal funds.

25. ENERGY EFFICIENCY

The Contractor shall comply with all standards and policies relating to energy efficiency which are contained in the energy conservation plan issued in compliance with the Energy Policy and Conservation Act (42 U.S.C. § 6201) for the State in which the Work under the Contract is performed.

26. ENVIRONMENTAL REQUIREMENTS

When constructing a Project involving trenching and/or other related earth excavations, the Contractor shall comply with the following environmental constraints:

(1) **Wetlands**. When disposing of excess, spoil, or other construction materials on public or private property, the Contractor shall not fill in or otherwise convert wetlands.

(2) **Floodplains**. When disposing of excess, spoil, or other construction materials on public or private property, the Contractor shall not fill in or otherwise convert 100 year floodplain areas delineated on the latest Federal Emergency Management Agency (FEMA) Floodplain Maps, or other appropriate maps, i.e., alluvial soils on Natural Resource Conservation Service (NRCS) Soil Survey Maps.

(3) **Endangered Species**. The Contractor shall comply with the Endangered Species Act, which provides for the protection of endangered and/or threatened species and critical habitat. Should any evidence of the presence of endangered and/or threatened species or their critical habitat be brought to the attention of the Contractor, the Contractor will immediately report this evidence to the Owner and a representative of EDA. Construction shall be temporarily halted pending the notification process and further directions issued by EDA after consultation with the U.S. Fish and Wildlife Service.

27. DEBARMENT, SUSPENSION, INELIGIBILITY, AND VOLUNTARY EXCLUSIONS

As required by Executive Orders 12549 and 12689, *Debarment and Suspension*, 2 C.F.R. Part 180 and implemented by the Department of Commerce at 2 C.F.R. part 1326, for prospective participants in lower tier covered transactions (except subcontracts for goods or services under the $25,000 small purchase threshold unless the subrecipient will have a critical influence on or substantive control over the award), the Contractor agrees that:

(1) By entering into this Contract, the Contractor and subcontractors certify, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared

ineligible, or voluntarily excluded from participation in this Contract by any federal department or agency.

(2) Where the Contractor or subcontractors are unable to certify to any of the statements in this certification, the Contractor or subcontractors shall attach an explanation to this bid.

See also 2 C.F.R. part 180 and 2 C.F.R. § 200.342.

28. **EDA PROJECT SIGN**

The Contractor shall supply, erect, and maintain in good condition a Project sign according to the specifications provided by EDA. To the extent practical, the sign should be a free standing sign. Project signs shall not be located on public highway rights-of-way. Location and height of signs will be coordinated with the local agency responsible for highway or street safety in the Project area, if any possibility exists for obstructing vehicular traffic line of sight. Whenever the EDA site sign specifications conflict with State law or local ordinances, the EDA Regional Director will permit such conflicting specifications to be modified so as to comply with State law or local ordinance.

29. **BUY AMERICA**

To the greatest extent practicable, contractors are encouraged to purchase American-made equipment and products with funding provided under EDA financial assistance awards.

Appendix B

Notice of Requirements for Affirmative Action

NOTE: To find the Goals for minority participation (%), click "What to use?" and search for the project's County.

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NOTICE OF REQUIREMENTS FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY (EXECUTIVE ORDER 11246 AND 41 CFR PART 60-4)

The following Notice shall be included in, and shall be a part of all solicitations for offers and bids on all Federal and federally assisted construction contracts or subcontracts in excess of $10,000.

The Offeror's or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set forth herein.

The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

Timetables	Goals for minority participation for each trade	Goals for female participation for each trade
What % to use?	15.1 %	6.9%

These goals are applicable to all the Contractor's construction work (whether or not it is Federal or federally assisted) performed in the covered area. If the contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the contractor also is subject to the goals for both its federally involved and non federally involved construction.
The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade and the contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the Executive Order, and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

The Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any construction subcontract in excess of $10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address and telephone number of the subcontractor; employer identification number of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the subcontract is to be performed.
As used in this Notice, and in the contract resulting from this solicitation, the "covered area" is:

State of Alaska

County of _____

City of Savoonga

Appendix C

Certification Regarding Lobbying

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FORM **CD-512**
(REV 12-04)

U.S. DEPARTMENT OF COMMERCE

CERTIFICATION REGARDING LOBBYING
LOWER TIER COVERED TRANSACTIONS

Applicants should review the instructions for certification included in the regulations before completing this form. Signature on this form provides for compliance with certification requirements under 15 CFR Part 28, "New Restrictions on Lobbying."

LOBBYING

As required by Section 1352, Title 31 of the U.S. Code, and implemented at 15 CFR Part 28, for persons entering into a grant, cooperative agreement or contract over $100,000 or a loan or loan guarantee over $150,000 as defined at 15 CFR Part 28, Sections 28.105 and 28.110, the applicant certifies that to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure occurring on or before October 23, 1996, and of not less than $11,000 and not more than $110,000 for each such failure occurring after October 23, 1996.

Statement for Loan Guarantees and Loan Insurance

The undersigned states, to the best of his or her knowledge and belief, that:

In any funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this commitment providing for the United States to insure or guarantee a loan, the undersigned shall complete and submit Standard Form-LLL, ''Disclosure Form to Report Lobbying,'' in accordance with its instructions.

Submission of this statement is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required statement shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure occurring on or before October 23, 1996, and of not less than $11,000 and not more than $110,000 for each such failure occurring after October 23, 1996.

As the duly authorized representative of the applicant, I hereby certify that the applicant will comply with the above applicable certification.

NAME OF APPLICANT	AWARD NUMBER AND/OR PROJECT NAME

PRINTED NAME AND TITLE OF AUTHORIZED REPRESENTATIVE

What % to use?

SIGNATURE	DATE
	NOTE: To find the Goals for minority particip

Appendix D

Prevailing Wage Determination

"General Decision Number: AK20240001 01/05/2024

Superseded General Decision Number: AK20230001

State: Alaska

Construction Types: Building and Heavy

Counties: Alaska Statewide.

BUILDING AND HEAVY CONSTRUCTION PROJECTS (does not include residential construction consisting of single family homes and apartments up to and including 4 stories)

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(1).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	. Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least $17.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2024.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least $12.90 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2024.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at http://www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/05/2024

ASBE0007-006 02/27/2023

	Rates	Fringes
Asbestos Workers/Insulator (includes application of all insulating materials protective coverings, coatings and finishings to all types of mechanical systems)	$ 41.35	16.46
HAZARDOUS MATERIAL HANDLER (includes preparation, wetting, stripping, removal scrapping, vacuming, bagging, and disposing of all insulation materials, whether they contain asbestos or not, from mechanical systems)	$ 37.38	19.55

BOIL0502-002 01/01/2021

	Rates	Fringes
BOILERMAKER	$ 47.03	30.59

BRAK0001-002 07/01/2020

	Rates	Fringes
Bricklayer, Blocklayer, Stonemason, Marble Mason, Tile Setter, Terrazzo Worker	$ 42.16	19.67
Tile & Terrazzo Finisher	$ 35.99	19.67

CARP1281-001 09/01/2022

	Rates	Fringes
CARPENTER		
Including Lather and Drywall Hanging	$ 43.34	28.86

CARP1281-002 09/01/2022

	Rates	Fringes
MILLWRIGHT	$ 46.48	24.32

CARP2520-003 09/01/2022

	Rates	Fringes
Diver		
Stand-by	$ 47.65	28.32
Tender	$ 46.65	28.32
Working	$ 87.45	28.32
Piledriver		
Piledriver; Skiff Operator and Rigger	$ 38.34	26.51
Sheet Stabber	$ 38.34	26.51
Welder	$ 43.90	26.51

DEPTH PAY PREMIUM FOR DIVERS BELOW WATER SURFACE:

50-100 feet	$1.00 per foot
101 feet and deeper	$2.00 per foot

ENCLOSURE PAY PREMIUM WITH NO VERTICAL ASCENT:

5-50 FEET	$1.00 PER FOOT/DAY
51-100 FEET	$2.00 PER FOOT/DAY
101 FEET AND ABOVE	$3.00 PER FOOT/DAY

SATURATION DIVING:
The standby rate applies until saturation starts. The saturation diving rate applies when divers are under pressure continuously until work task and decompression are complete. the diver rate shall be paid for all saturation hours.

WORK IN COMBINATION OF CLASSIFICATIONS:
Employees working in any combination of classifications within the diving crew (except dive supervisor) in a shift are paid in the classification with the highest rate for that shift.

ELEC1547-004 09/01/2023

	Rates	Fringes
CABLE SPLICER	$ 46.44	3%+28.39
ELECTRICIAN	$ 46.44	3%+28.39

ELEC1547-005 04/01/2023

Line Construction

	Rates	Fringes
CABLE SPLICER	$ 63.44	3%+31.90
Linemen (Including Equipment Operators, Technician)	$ 61.29	3%+30.98
Powderman	$ 61.44	3%+32.69
TREE TRIMMER	$ 40.71	3%+28.05

ELEV0019-002 01/01/2023

	Rates	Fringes
ELEVATOR MECHANIC	$ 65.83	37.335+a+b

FOOTNOTE: a. Employer contributes 8% of the basic hourly rate for over 5 year's service and 6% of the basic hourly rate for 6 months to 5 years' of service as vacation paid credit. b. Eight paid holidays: New Year's Day; Memorial Day; Independence Day; Labor Day; Veteran's Day; Thanksgiving Day; Friday after Thanksgiving, and Christmas Day

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ENGI0302-002 04/01/2023

	Rates	Fringes
POWER EQUIPMENT OPERATOR		
GROUP 1	$ 47.74	27.20
GROUP 1A	$ 49.64	27.20
GROUP 2	$ 46.91	27.20
GROUP 3	$ 46.13	27.20
GROUP 4	$ 39.42	27.20
TUNNEL WORK		
GROUP 1	$ 52.51	27.20
GROUP 1A	$ 54.60	27.20
GROUP 2	$ 51.60	27.20
GROUP 3	$ 50.74	27.20

GROUP 4.....$ 43.36 27.20

POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP 1: Asphalt Roller: Breakdown, Intermediate, and Finish; Back Filler; Barrier Machine (Zipper); Beltcrete with power pack and similar conveyors; Bending Machine; Boat Coxwains; Bulldozers; Cableways, Highlines and Cablecars; Cleaning Machine; Coating Machine; Concrete Hydro Blaster; Cranes-45 tons and under or 150 foot boom and under (including jib and attachments): (a) Hydralifts or Transporters, all track or truck type,(b) Derricks; Crushers; Deck Winches-Double Drum; Ditching or Trenching Machine (16 inch or over); Drilling Machines, core, cable, rotary and exploration; Finishing Machine Operator, Concrete Paving, Laser Screed, Sidewalk, Curb and Gutter Machine; Helicopters; Hover Craft, Flex Craft, Loadmaster, Air Cushion, All Terrain Vehicle, Rollagon, Bargecable, Nodwell, and Snow Cat; Hydro Ax: Feller Buncher and similar; Loaders (2 1/2 yards through 5 yards, including all attachments): Forklifts with telescopic boom and swing attachment, Overhead and front end, 2 1/2 yards through 5 yards, Loaders with forks or pipe clamps; Loaders, elevating belt type, Euclid and similar types; Mechanics, Bodyman; Micro Tunneling Machine; Mixers: Mobile type w/hoist combination; Motor Patrol Grader; Mucking Machines: Mole, Tunnel Drill, Horizontal/Directional Drill Operator, and/or Shield; Operator on Dredges; Piledriver Engineers, L. B. Foster, Puller or similar Paving Breaker; Power Plant, Turbine Operator, 200 k.w. and over (power plants or combination of power units over 300 k.w.); Scrapers-through 40 yards; Service Oiler/Service Engineer; Sidebooms-under 45 tons; Shot Blast Machine; Shovels, Backhoes, Excavators with all attachments, and Gradealls (3 yards and under), Spreaders, Blaw Knox, Cedarapids, Barber Greene, Slurry Machine; Sub-grader (Gurries, Reclaimer, and similar types); Tack tractor; Truck mounted Concrete Pumps, Conveyor, Creter; Water Kote Machine; Unlicensed off road hauler

GROUP 1A: Camera/Tool/Video Operator (Slipline), Cranes-over 45 tons or 150 foot (including jib and attachments): (a) Clamshells and Draglines (over 3 yards), (b) Tower cranes; Licensed Water/Waste Water Treatment Operator; Loaders over 5 yds.; Certified Welder, Electrical Mechanic, Camp Maintenance Engineer, Mechanic (over 10,000 hours); Motor Patrol Grader, Dozer, Grade Tractor, Roto-mill/Profiler (finish: when finishing to final grade and/or to hubs, or for asphalt); Power Plants: 1000 k.w. and over; Quad; Screed; Shovels, Backhoes, Excavators with

all attachments (over 3 yards), Sidebooms over 45 tons; Slip Form Paver, C.M.I. and similar types; Scrapers over 40 yards;

GROUP 2: Boiler-fireman; Cement Hog and Concrete Pump Operator; Conveyors (except as listed in group 1); Hoist on steel erection; Towermobiles and Air Tuggers; Horizontal/Directional Drill Locator;Licensed Grade Technician; Loaders, (i.e., Elevating Grader and Material Transfer Vehicle); Locomotives: rod and geared engines; Mixers; Screening, Washing Plant; Sideboom (cradling rock drill regardless of size); Skidder; Trencing Machine under 16 inches; Waste/ Waste Water Treatment Operator.

GROUP 3: ""A"" Frame Trucks, Deck Winches: single power drum; Bombardier (tack or tow rig); Boring Machine; Brooms-power; Bump Cutter; Compressor; Farm tractor; Forklift, industrial type; Gin Truck or Winch Truck with poles when used for hoisting; Grade Checker and Stake Hopper; Hoist, Air Tuggers, Elevators; Loaders: (a) Elevating-Athey, Barber Green and similar types (b) Forklifts or Lumber Carrier (on construction job site) (c) Forklifts with Tower (d) Overhead and Front-end, under 2 1/2 yds. Locomotives:Dinkey (air, steam, gas and electric) Speeders; Mechanics (light duty); Oil, Blower Distribution; Post Hole Diggers, mechanical; Pot Fireman (power agitated); Power Plant, Turbine Operator, under 200 k.w.; Pumps-water; Roller-other than Plantmix; Saws, concrete; Skid Steer with all attachments; Straightening Machine; Tow Tractor

GROUP 4: Rig Oiler/Crane Assistant Engineer;Parts and Equipment Coordinator; Swamper (on trenching machines or shovel type equipment); Spotter; Steam Cleaner; Drill Helper.

FOOTNOTE: Groups 1-4 receive 10% premium while performing tunnel or underground work. Rig Oiler/Crane Assistant Engineer shall be required on cranes over 85 tons or over 100 feet of boom.

IRON0751-003 07/01/2023

	Rates	Fringes
IRONWORKER		
BENDER OPERATOR.....	$ 42.99	37.38
BRIDGE, STRUCTURAL, ORNAMENTAL, REINFORCING MACHINERY MOVER, RIGGER,		

SHEETER, STAGE RIGGER,
BENDER OPERATOR.....$ 42.99 37.38
FENCE, BARRIER INSTALLER....$ 39.49 37.38
GUARDRAIL INSTALLERS.....$ 40.49 37.38
GUARDRAIL LAYOUT MAN.....$ 40.23 37.38
HELICOPTER, TOWER.....$ 43.99 37.38

LABO0341-001 04/01/2023

	Rates	Fringes
LABORER (South of the 63rd Parallel & West of Longitude 138 Degrees)		
GROUP 1	$ 36.00	32.56
GROUP 2	$ 37.00	32.56
GROUP 3	$ 37.90	32.56
GROUP 3A	$ 41.78	32.56
GROUP 3B	$ 47.36	28.51
GROUP 4	$ 25.57	32.56
TUNNELS, SHAFTS, AND RAISES		
GROUP 1	$ 39.60	32.56
GROUP 2	$ 40.70	32.56
GROUP 3	$ 41.69	32.56
GROUP 3A	$ 45.96	32.56
GROUP 3B	$ 52.10	28.51

LABORERS CLASSIFICATIONS

GROUP 1: Asphalt Workers (shovelman, plant crew); Brush Cutters; Camp Maintenance Laborer; Carpenter Tenders; Choke Setters, Hook Tender, Rigger, Signalman; Concrete Laborer(curb and gutter, chute handler, grouting, curing, screeding); Crusher Plant Laborer; Demolition Laborer; Ditch Diggers; Dump Man; Environmental Laborer (asbestos (limited to nonmechanical systems), hazardous and toxic waste, oil spill); Fence Installer; Fire Watch Laborer; Flagman; Form Strippers; General Laborer; Guardrail Laborer, Bridge Rail Installers; Hydro-Seeder Nozzleman; Laborers (building); Landscape or Planter; Laying of Decorative Block (retaining walls, flowered decorative block 4 feet and below); Material Handlers; Pneumatic or Power Tools; Portable or Chemical Toilet Serviceman; Pump Man or Mixer Man; Railroad Track Laborer; Sandblast, Pot Tender; Saw Tenders; Scaffold Building and Erecting; Slurry Work; Stake Hopper; Steam Point or Water Jet Operator; Steam Cleaner Operator; Tank Cleaning; Utiliwalk, Utilidor Laborer and Conduit Installer; Watchman (construction projects); Window Cleaner

GROUP 2: Burning and Cutting Torch; Cement or Lime Dumper or Handler (sack or bulk); Choker Splicer; Chucktender (wagon, airtrack and hydraulic drills); Concrete Laborers (power buggy, concrete saws, pumpcrete nozzleman, vibratorman); Culvert Pipe Laborer; Cured in place Pipelayer; Environmental Laborer (marine work, oil spill skimmer operator, small boat operator); Foam Gun or Foam Machine Operator; Green Cutter (dam work); Gunnite Operator; Hod Carriers; Jackhammer or Pavement Breakers (more than 45 pounds);Laying of Decorative Block (retaining walls, flowered decorative block above 4 feet); Mason Tender and Mud Mixer (sewer work); Pilot Car; Plasterer, Bricklayer and Cement Finisher Tenders; Power Saw Operator; Railroad Switch Layout Laborer; Sandblaster; Sewer Caulkers; Sewer Plant Maintenance Man; Thermal Plastic Applicator; Timber Faller, chain saw operator, filer; Timberman

GROUP 3: Alarm Installer; Bit Grinder; Guardrail Machine Operator; High Rigger and tree topper; High Scaler; Multiplate; Slurry Seal Squeegee Man

GROUP 3A: Asphalt Raker, Asphalt Belly dump lay down; Drill Doctor (in the field); Drillers (including, but not limited to, wagon drills, air track drills; hydraulic drills); Powderman; Pioneer Drilling and Drilling Off Tugger (all type drills); Pipelayers

GROUP 3B: Grade checker (setting or transfering of grade marks, line and grade)

GROUP 4: Final Building Cleanup

TUNNELS, SHAFTS, AND RAISES CLASSIFICATIONS

GROUP 1: Brakeman; Muckers; Nippers; Topman and Bull Gang; Tunnel Track Laborer

GROUP 2: Burning and Cutting Torch; Concrete Laborers; Jackhammers; Nozzleman, Pumpcrete or Shotcrete.

GROUP 3: Miner; Retimberman

GROUP 3A: Asphalt Raker, Asphalt Belly dump lay down; Drill Doctor (in the field); Drillers (including, but not limited to, wagon drills, air track drills; hydraulic drills); Powderman; Pioneer Drilling and Drilling Off Tugger (all type drills); Pipelayers.

GROUP 3B: Grade checker (setting or transfering of grade marks, line and grade)

Tunnel shaft and raise rates only apply to workers regularly employed inside a tunnel portal or shaft collar.

LABO0942-001 04/01/2023

	Rates	Fringes
Laborers: North of the 63rd Parallel & East of Longitude 138 Degrees		
GROUP 1	$ 36.00	32.56
GROUP 2	$ 37.00	32.56
GROUP 3	$ 37.90	32.56
GROUP 3A	$ 41.78	32.56
GROUP 3B	$ 47.36	28.51
GROUP 4	$ 25.57	32.56
TUNNELS, SHAFTS, AND RAISES		
GROUP 1	$ 39.60	32.56
GROUP 2	$ 40.70	32.56
GROUP 3	$ 41.69	32.56
GROUP 3A	$ 45.96	32.56
GROUP 3B	$ 52.10	32.56

LABORERS CLASSIFICATIONS

GROUP 1: Asphalt Workers (shovelman, plant crew); Brush Cutters; Camp Maintenance Laborer; Carpenter Tenders; Choke Setters, Hook Tender, Rigger, Signalman; Concrete Laborer(curb and gutter, chute handler, grouting, curing, screeding); Crusher Plant Laborer; Demolition Laborer; Ditch Diggers; Dump Man; Environmental Laborer (asbestos (limited to nonmechanical systems), hazardous and toxic waste, oil spill); Fence Installer; Fire Watch Laborer; Flagman; Form Strippers; General Laborer; Guardrail Laborer, Bridge Rail Installers; Hydro-Seeder Nozzleman; Laborers (building); Landscape or Planter; Laying of Decorative Block (retaining walls, flowered decorative block 4 feet and below); Material Handlers; Pneumatic or Power Tools; Portable or Chemical Toilet Serviceman; Pump Man or Mixer Man; Railroad Track Laborer; Sandblast, Pot Tender; Saw Tenders; Scaffold Building and Erecting; Slurry Work; Stake Hopper; Steam Point or Water Jet Operator; Steam Cleaner Operator; Tank Cleaning; Utiliwalk, Utilidor Laborer and Conduit Installer; Watchman (construction projects); Window Cleaner

GROUP 2: Burning and Cutting Torch; Cement or Lime Dumper or Handler (sack or bulk); Choker Splicer; Chucktender (wagon,

airtrack and hydraulic drills); Concrete Laborers (power buggy, concrete saws, pumpcrete nozzleman, vibratorman); Culvert Pipe Laborer; Cured in place Pipelayer; Environmental Laborer (marine work, oil spill skimmer operator, small boat operator); Foam Gun or Foam Machine Operator; Green Cutter (dam work); Gunnite Operator; Hod Carriers; Jackhammer or Pavement Breakers (more than 45 pounds);Laying of Decorative Block (retaining walls, flowered decorative block above 4 feet); Mason Tender and Mud Mixer (sewer work); Pilot Car; Plasterer, Bricklayer and Cement Finisher Tenders; Power Saw Operator; Railroad Switch Layout Laborer; Sandblaster; Sewer Caulkers; Sewer Plant Maintenance Man; Thermal Plastic Applicator; Timber Faller, chain saw operator, filer; Timberman

GROUP 3: Alarm Installer; Bit Grinder; Guardrail Machine Operator; High Rigger and tree topper; High Scaler; Multiplate; Slurry Seal Squeegee Man

GROUP 3A: Asphalt Raker, Asphalt Belly dump lay down; Drill Doctor (in the field); Drillers (including, but not limited to, wagon drills, air track drills; hydraulic drills); Powderman; Pioneer Drilling and Drilling Off Tugger (all type drills); Pipelayers

GROUP 3B: Grade checker (setting or transfering of grade marks, line and grade)

GROUP 4: Final Building Cleanup

TUNNELS, SHAFTS, AND RAISES CLASSIFICATIONS

GROUP 1: Brakeman; Muckers; Nippers; Topman and Bull Gang; Tunnel Track Laborer

GROUP 2: Burning and Cutting Torch; Concrete Laborers; Jackhammers; Nozzleman, Pumpcrete or Shotcrete.

GROUP 3: Miner; Retimberman

GROUP 3A: Asphalt Raker, Asphalt Belly dump lay down; Drill Doctor (in the field); Drillers (including, but not limited to, wagon drills, air track drills; hydraulic drills); Powderman; Pioneer Drilling and Drilling Off Tugger (all type drills); Pipelayers.

GROUP 3B: Grade checker (setting or transfering of grade marks, line and grade)

Tunnel shaft and raise rates only apply to workers regularly

employed inside a tunnel portal or shaft collar.

PAIN1959-001 07/01/2022

NORTH OF THE 63RD PARALLEL

	Rates	Fringes
PAINTER		
BRUSH/ROLLER PAINT OR WALL COVERER	$ 36.08	25.45
TAPING, TEXTURING, STRUCTURAL PAINTING, SANDBLASTING, POT TENDER, FINISH METAL, SPRAY, BUFFER OPERATOR, RADON MITIGATION, LEAD BASED PAINT ABATEMENT, HAZARDOUS MATERIAL HANDLER	$ 36.60	25.45

PAIN1959-002 12/01/2021

SOUTH OF THE 63RD PARALLEL

	Rates	Fringes
PAINTER		
General Painter	$ 32.64	25.95
Industrial Painter	$ 32.74	25.95
Taper / Paper & Vinyl Hanger	$ 32.64	25.95

PAIN1959-003 12/01/2021

NORTH OF THE 63RD PARALLEL

	Rates	Fringes
GLAZIER	$ 41.16	28.16

PAIN1959-004 07/01/2019

	Rates	Fringes
FLOOR LAYER: Carpet	$ 28.75	14.44

PAIN1959-006 12/01/2021

SOUTH OF THE 63RD PARALLEL

	Rates	Fringes
GLAZIER	$ 41.37	27.25

PLAS0528-006 04/01/2023

	Rates	Fringes
PLASTERER		
North of the 63rd parallel	$ 44.43	22.13
South of the 63rd parallel	$ 44.43	22.13

PLAS0528-007 04/01/2023

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER		
North of the 63rd parallel	$ 44.43	22.13
South of the 63rd parallel	$ 44.43	22.13

PLUM0262-002 01/01/2023

East of the 141st Meridian

	Rates	Fringes
Plumber; Steamfitter	$ 41.50	27.62

PLUM0367-002 07/01/2021

South of the 63rd Parallel

	Rates	Fringes
Plumber; Steamfitter	$ 41.00	27.95

PLUM0375-002 07/01/2023

North of the 63rd Parallel

	Rates	Fringes
Plumber; Steamfitter	$ 46.86	32.50

PLUM0669-002 04/01/2023

	Rates	Fringes
SPRINKLER FITTER	$ 54.01	30.22

ROOF0189-006 04/01/2023

	Rates	Fringes
ROOFER	$ 47.62	18.53

SHEE0023-003 07/01/2023

South of the 63rd Parallel

	Rates	Fringes
SHEET METAL WORKER	$ 47.05	29.41

SHEE0023-004 07/01/2023

North of the 63rd Parallel

	Rates	Fringes
SHEET METAL WORKER	$ 51.93	30.16

TEAM0959-003 04/01/2023

	Rates	Fringes
TRUCK DRIVER		
GROUP 1	$ 46.84	24.33
GROUP 1A	$ 48.19	24.33
GROUP 2	$ 45.51	24.33
GROUP 3	$ 44.64	24.33
GROUP 4	$ 44.02	24.33
GROUP 5	$ 43.22	24.33

GROUP 1: Semi with Double Box Mixer; Dump Trucks (including rockbuggy and trucks with pups) over 40 yards up to and including 60 yards; Deltas, Commanders, Rollogans and similar equipment when pulling sleds, trailers or similar equipment; Boat Coxswain; Lowboys including attached trailers and jeeps, up to and including 12 axles; Ready-mix over 12 yards up to and including 15 yards); Water Wagon (250 Bbls and above); Tireman, Heavy Duty/Fueler

GROUP 1A: Dump Trucks (including Rockbuggy and Trucks with pups) over 60 yards up to and including 100 yards; Jeeps (driver under load)

GROUP 2: Turn-O-Wagon or DW-10 not self-loading; All Deltas, Commanders, Rollogans, and similar equipment; Mechanics;

Dump Trucks (including Rockbuggy and Trucks with pups) over 20 yards up to and including 40 yards; Lowboys including attached trailers and jeeps up to and including 8 axles; Super vac truck/cacasco truck/heat stress truck; Ready-mix over 7 yards up to and including 12 yards; Partsman; Stringing Truck

GROUP 3: Dump Trucks (including Rockbuggy and Trucks with pups) over 10 yards up to and including 20 yards; batch trucks 8 yards and up; Oil distributor drivers; Oil Distributor Drivers; Trucks/Jeeps (push or pull); Traffic Control Technician

GROUP 4: Buggymobile; Semi or Truck and trailer; Dumpster; Tireman (light duty); Dump Trucks (including Rockbuggy and Truck with pups) up to and including 10 yards; Track Truck Equipment; Grease Truck; Flat Beds, dual rear axle; Hyster Operators (handling bulk aggregate); Lumber Carrier; Water Wagon, semi; Water Truck, dual axle; Gin Pole Truck, Winch Truck, Wrecker, Truck Mounted ""A"" Frame manufactured rating over 5 tons; Bull Lifts and Fork Lifts with Power Boom and Swing attachments, over 5 tons; Front End Loader with Forks; Bus Operator over 30 passengers; All Terrain Vehicles; Boom Truck/Knuckle Truck over 5 tons; Foam Distributor Truck/dual axle; Hydro-seeders, dual axle; Vacuum Trucks, Truck Vacuum Sweepers; Loadmaster (air and water); Air Cushion or similar type vehicle; Fire Truck/Ambulance Driver; Combination Truck-fuel and grease; Compactor (when pulled by rubber tired equipment); Rigger (air/water/oilfield); Ready Mix, up to and including 7 yards;

GROUP 5: Gravel Spreader Box Operator on Truck; Flat Beds, single rear axle; Boom Truck/Knuckle Truck up to and including 5 tons; Pickups (Pilot Cars and all light duty vehicles); Water Wagon (Below 250 Bbls); Gin Pole Truck, Winch Truck, Wrecker, Truck Mounted ""A"" Frame, manufactured rating 5 tons and under; Bull Lifts and Fork Lifts (fork lifts with power broom and swing attachments up to and including 5 tons); Buffer Truck; Tack Truck; Farm type Rubber Tired Tractor (when material handling or pulling wagons on a construction project); Foam Distributor, single axle; Hydro-Seeders, single axle; Team Drivers (horses, mules and similar equipment); Fuel Handler (station/bulk attendant); Batch Truck, up to and including 7 yards; Gear/Supply Truck; Bus Operator, Up to 30 Passengers; Rigger/Swamper

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WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at https://www.dol.gov/agencies/whd/government-contracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this

classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION"

Appendix E

ARPA Sign Specs

Variations and Usage

There is one approved mark associated with the Investing In America logo. To preserve the integrity of the Investing In America logo mark, make sure to apply them correctly. Altering, distorting, or recreating the 'marks' in any way weakens the power of the image and what it represents. Layout and design of signs and communication materials will vary, so care must be taken when applying the logo mark.

Primary Logo Mark

INVESTING IN AMERICA

Colors

The colors, graphics, and fonts used should conform to graphic standards.

COLOR	CMYK	RGB	HEX	PMS
Blue	83, 48, 0, 48	22 / 68 / 132	#164484	PMS 7687 C
Red	0, 100, 81, 0	255 / 0 / 49	#FF0031	PMS 185 C
White	2, 2, 0, 3	242 / 244 / 248	#F2F4F8	Bright White

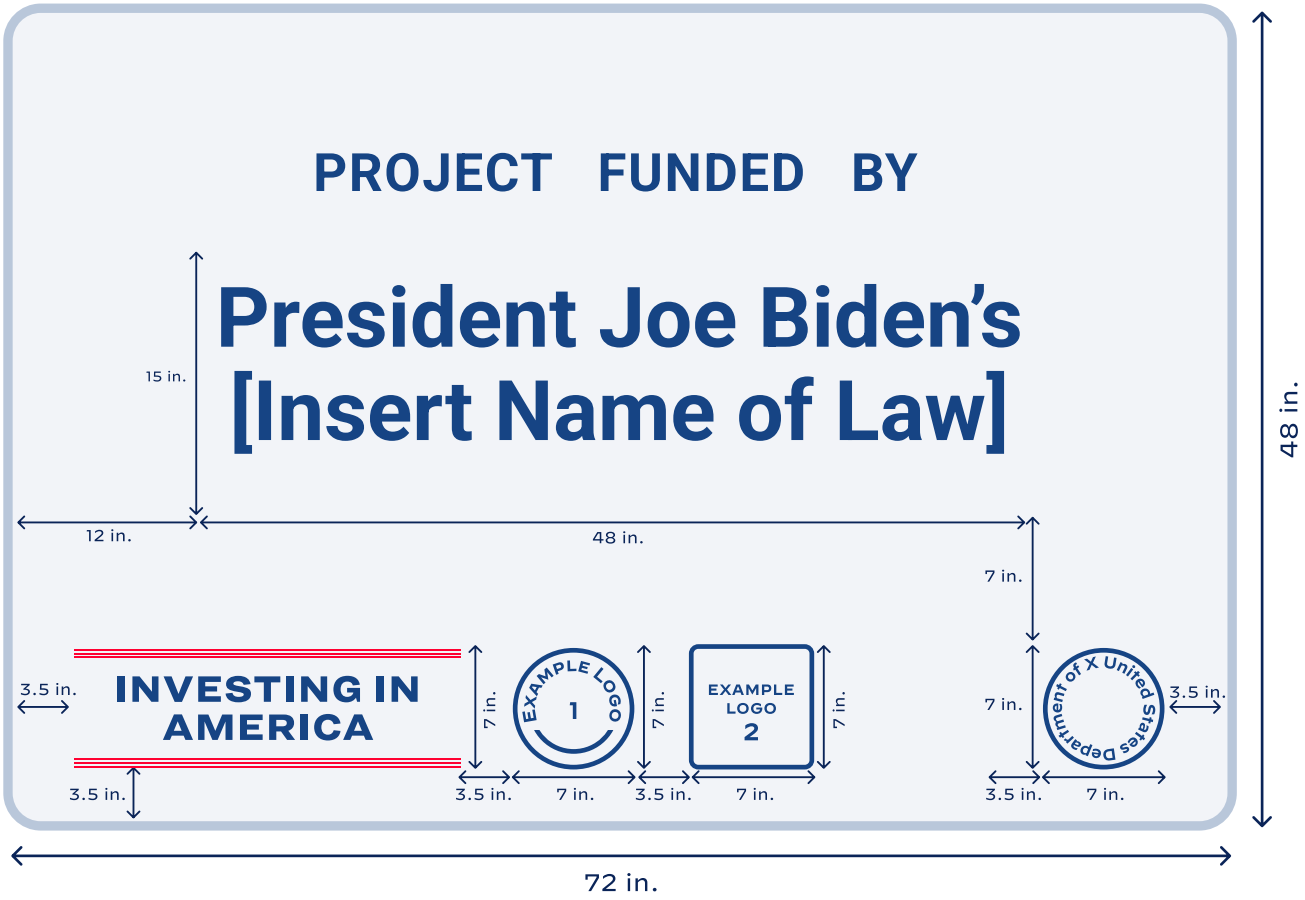
Logos

White background: logo in red and blue

Gray background: logo in red and blue

Blue background: logo in all white

Investing In America General Guidelines for Logo Applications



Sign Colors

4. The American Rescue Plan

White

Gray

Blue

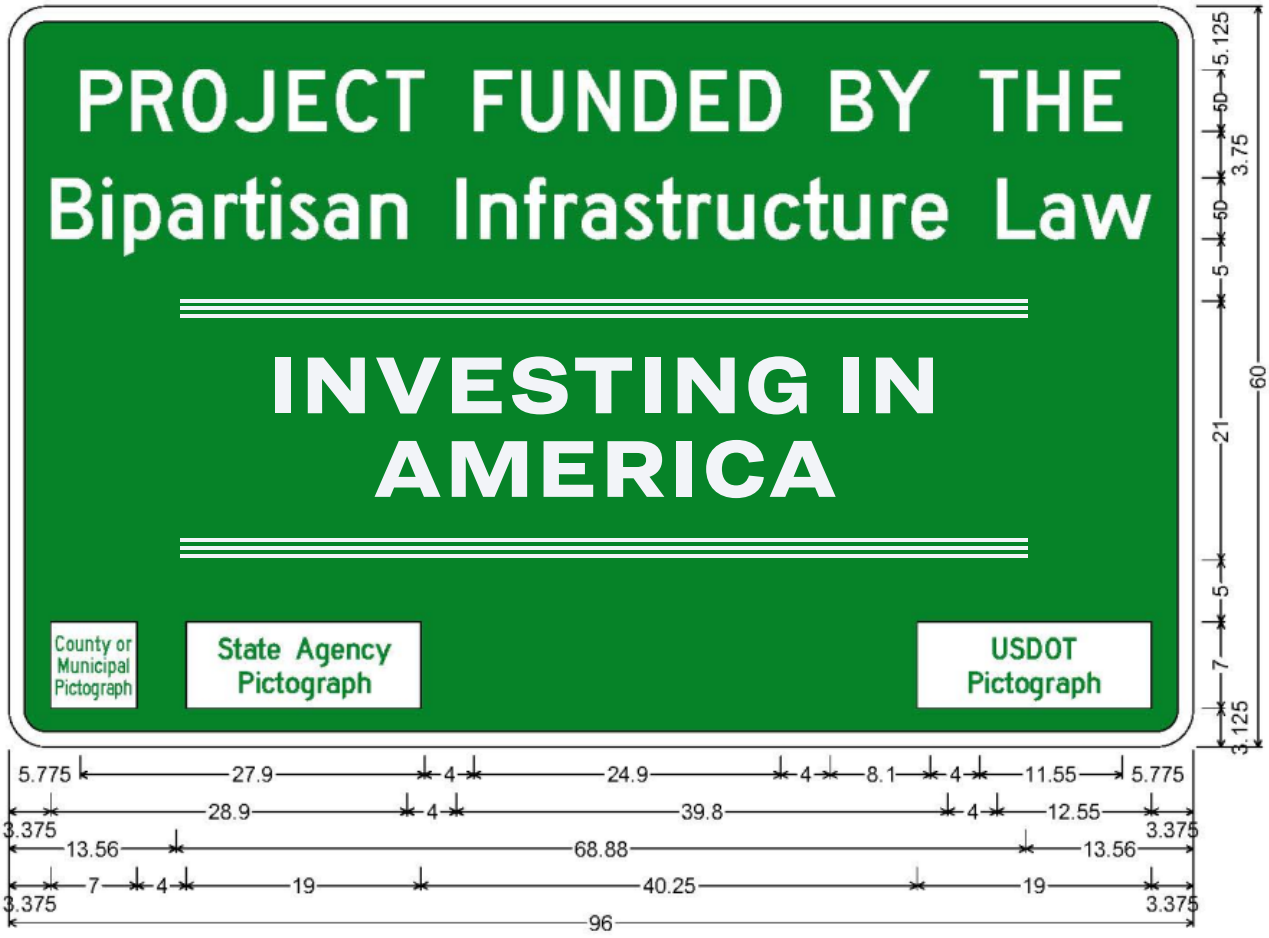
Red Border

State, City, and County Logo Variations

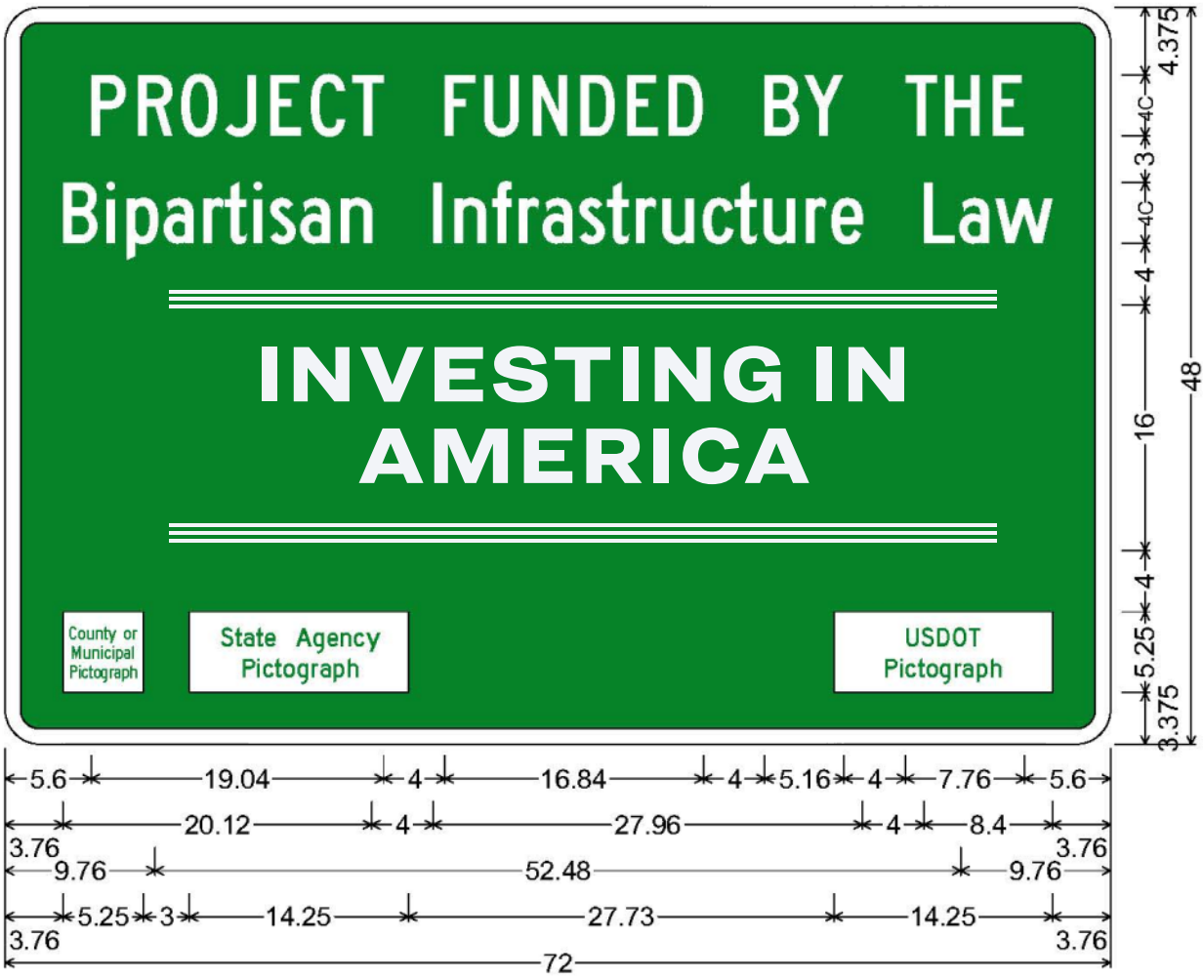
Square or Circular State Logo: 7x7 in.

Rectangular or Oval State Logo: **not** to exceed 17.5 x 7 in.

Rules for Highway Right of Way Signage 8 Feet



Rules for Highway Right of Way Signage 6 Feet



Appendix F

Sample AIA Document A101
Standard Form of Agreement Between Owner and Contractor

AIA® Document A101™ – 2017

Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum

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)

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

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

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

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

The parties should complete A101™–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement.

AIA Document A201™–2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

The Owner and Contractor agree as follows.

TABLE OF ARTICLES

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:
(Check one of the following boxes.)

☐ The date of this Agreement.

☐ A date set forth in a notice to proceed issued by the Owner.

☐ Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

§ 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:
(Check one of the following boxes and complete the necessary information.)

☐ Not later than ( ) calendar days from the date of commencement of the Work.

☐ By the following date:

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work are to be completed prior to Substantial Completion of the entire Work, the Contractor shall achieve Substantial Completion of such portions by the following dates:

Portion of Work	Substantial Completion Date

§ 3.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be ($), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 Alternates

§ 4.2.1 Alternates, if any, included in the Contract Sum:

Item	Price

§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance

§ 4.3 Allowances, if any, included in the Contract Sum:
(Identify each allowance.)

Item	Price

§ 4.4 Unit prices, if any:
(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)

§ 4.5 Liquidated damages, if any:
(Insert terms and conditions for liquidated damages, if any.)

§ 4.6 Other:
(Insert provisions for bonus or other incentives, if any, that might result in a change to the Contract Sum.)

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the day of the month. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than ( ) days after the Architect receives the Application for Payment.
(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 In accordance with AIA Document A201™–2017, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.1 The amount of each progress payment shall first include:

.1 That portion of the Contract Sum properly allocable to completed Work;

.2 That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and

.3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.6.2 The amount of each progress payment shall then be reduced by:

.1 The aggregate of any amounts previously paid by the Owner;

.2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;

.3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;

.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017; and

.5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:
(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

§ 5.1.7.1.1 The following items are not subject to retainage:
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, upon Substantial Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted at Substantial Completion shall not include retainage as follows:
(Insert any other conditions for release of retainage upon Substantial Completion.)

§ 5.1.8 If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A201–2017.

§ 5.1.9 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 Final Payment

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment; and

.2 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows:

§ 5.3 Interest

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

_____ % _____

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201–2017, unless the parties appoint below another individual, not a party to this Agreement, to serve as the Initial Decision Maker.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A201–2017, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

☐ Arbitration pursuant to Section 15.4 of AIA Document A201–2017

☐ Litigation in a court of competent jurisdiction

☐ Other *(Specify)*

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2017.

§ 7.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Contractor a termination fee as follows:
(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2017.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2017 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:
(Name, address, email address, and other information)

§ 8.3 The Contractor's representative:
(Name, address, email address, and other information)

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior notice to the other party.

§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A101™–2017 Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:

(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format 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.)

§ 8.7 Other provisions:

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor

.2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds

.3 AIA Document A201™–2017, General Conditions of the Contract for Construction

.4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013 incorporated into this Agreement.)

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

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

☐ AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017 incorporated into this Agreement.)

☐ The Sustainability Plan:

Title	Date	Pages

☐ Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™–2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

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

OWNER *(Signature)*	CONTRACTOR *(Signature)*
(Printed name and title)	*(Printed name and title)*

Appendix G

Draft AIA Document 101 - Exhibit A
Insurance and Bonds

DRAFT

AIA® Document A101® – 2017 Exhibit A

Insurance and Bonds

This Insurance and Bonds Exhibit is part of the Agreement, between the Owner and the Contractor, dated the « » day of « » in the year « »
(In words, indicate day, month and year.)

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

« »
« »

THE OWNER:
(Name, legal status and address)

« »« »
« »

THE CONTRACTOR:
(Name, legal status and address)

« »« »
« »

TABLE OF ARTICLES

ARTICLE A.1 GENERAL

The Owner and Contractor shall purchase and maintain insurance, and provide bonds, as set forth in this Exhibit. As used in this Exhibit, the term General Conditions refers to AIA Document A201™–2017, General Conditions of the Contract for Construction.

ARTICLE A.2 OWNER'S INSURANCE

§ A.2.1 General

Prior to commencement of the Work, the Owner shall secure the insurance, and provide evidence of the coverage, required under this Article A.2 and, upon the Contractor's request, provide a copy of the property insurance policy or policies required by Section A.2.3. The copy of the policy or policies provided shall contain all applicable conditions, definitions, exclusions, and endorsements.

§ A.2.2 Liability Insurance

The Owner shall be responsible for purchasing and maintaining the Owner's usual general liability insurance.

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.
This document is intended to be used in conjunction with AIA Document A201®–2017, General Conditions of the Contract for Construction. Article 11 of A201®–2017 contains additional insurance provisions.

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§ A.2.3 Required Property Insurance

§ A.2.3.1 Unless this obligation is placed on the Contractor pursuant to Section A.3.3.2.1, the Owner shall purchase and maintain, from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located, property insurance written on a builder's risk "all-risks" completed value or equivalent policy form and sufficient to cover the total value of the entire Project on a replacement cost basis. The Owner's property insurance coverage shall be no less than the amount of the initial Contract Sum, plus the value of subsequent Modifications and labor performed and materials or equipment supplied by others. The property insurance shall be maintained until Substantial Completion and thereafter as provided in Section A.2.3.1.3, unless otherwise provided in the Contract Documents or otherwise agreed in writing by the parties to this Agreement. This insurance shall include the interests of the Owner, Contractor, Subcontractors, and Sub-subcontractors in the Project as insureds. This insurance shall include the interests of mortgagees as loss payees.

§ A.2.3.1.1 Causes of Loss. The insurance required by this Section A.2.3.1 shall provide coverage for direct physical loss or damage, and shall not exclude the risks of fire, explosion, theft, vandalism, malicious mischief, collapse, earthquake, flood, or windstorm. The insurance shall also provide coverage for ensuing loss or resulting damage from error, omission, or deficiency in construction methods, design, specifications, workmanship, or materials. Sub-limits, if any, are as follows:
(Indicate below the cause of loss and any applicable sub-limit.)

Causes of Loss	Sub-Limit

§ A.2.3.1.2 Specific Required Coverages. The insurance required by this Section A.2.3.1 shall provide coverage for loss or damage to falsework and other temporary structures, and to building systems from testing and startup. The insurance shall also cover debris removal, including demolition occasioned by enforcement of any applicable legal requirements, and reasonable compensation for the Architect's and Contractor's services and expenses required as a result of such insured loss, including claim preparation expenses. Sub-limits, if any, are as follows:
(Indicate below type of coverage and any applicable sub-limit for specific required coverages.)

Coverage	Sub-Limit

§ A.2.3.1.3 Unless the parties agree otherwise, upon Substantial Completion, the Owner shall continue the insurance required by Section A.2.3.1 or, if necessary, replace the insurance policy required under Section A.2.3.1 with property insurance written for the total value of the Project that shall remain in effect until expiration of the period for correction of the Work set forth in Section 12.2.2 of the General Conditions.

§ A.2.3.1.4 Deductibles and Self-Insured Retentions. If the insurance required by this Section A.2.3 is subject to deductibles or self-insured retentions, the Owner shall be responsible for all loss not covered because of such deductibles or retentions.

§ A.2.3.2 Occupancy or Use Prior to Substantial Completion. The Owner's occupancy or use of any completed or partially completed portion of the Work prior to Substantial Completion shall not commence until the insurance company or companies providing the insurance under Section A.2.3.1 have consented in writing to the continuance of coverage. The Owner and the Contractor shall take no action with respect to partial occupancy or use that would cause cancellation, lapse, or reduction of insurance, unless they agree otherwise in writing.

§ A.2.3.3 Insurance for Existing Structures

If the Work involves remodeling an existing structure or constructing an addition to an existing structure, the Owner shall purchase and maintain, until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, "all-risks" property insurance, on a replacement cost basis, protecting the existing structure against direct physical loss or damage from the causes of loss identified in Section A.2.3.1, notwithstanding the undertaking of the Work. The Owner shall be responsible for all co-insurance penalties.

§ A.2.4 Optional Extended Property Insurance.

The Owner shall purchase and maintain the insurance selected and described below.

(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. For each type of insurance selected, indicate applicable limits of coverage or other conditions in the fill point below the selected item.)

[« »] **§ A.2.4.1 Loss of Use, Business Interruption, and Delay in Completion Insurance**, to reimburse the Owner for loss of use of the Owner's property, or the inability to conduct normal operations due to a covered cause of loss.

« »

[« »] **§ A.2.4.2 Ordinance or Law Insurance**, for the reasonable and necessary costs to satisfy the minimum requirements of the enforcement of any law or ordinance regulating the demolition, construction, repair, replacement or use of the Project.

« »

[« »] **§ A.2.4.3 Expediting Cost Insurance**, for the reasonable and necessary costs for the temporary repair of damage to insured property, and to expedite the permanent repair or replacement of the damaged property.

« »

[« »] **§ A.2.4.4 Extra Expense Insurance**, to provide reimbursement of the reasonable and necessary excess costs incurred during the period of restoration or repair of the damaged property that are over and above the total costs that would normally have been incurred during the same period of time had no loss or damage occurred.

« »

[« »] **§ A.2.4.5 Civil Authority Insurance**, for losses or costs arising from an order of a civil authority prohibiting access to the Project, provided such order is the direct result of physical damage covered under the required property insurance.

« »

[« »] **§ A.2.4.6 Ingress/Egress Insurance**, for loss due to the necessary interruption of the insured's business due to physical prevention of ingress to, or egress from, the Project as a direct result of physical damage.

« »

[« »] **§ A.2.4.7 Soft Costs Insurance**, to reimburse the Owner for costs due to the delay of completion of the Work, arising out of physical loss or damage covered by the required property insurance: including construction loan fees; leasing and marketing expenses; additional fees, including those of architects, engineers, consultants, attorneys and accountants, needed for the completion of the construction, repairs, or reconstruction; and carrying costs such as property taxes, building permits, additional interest on loans, realty taxes, and insurance premiums over and above normal expenses.

« »

§ A.2.5 Other Optional Insurance.

The Owner shall purchase and maintain the insurance selected below.

(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance.)

[« »] **§ A.2.5.1 Cyber Security Insurance** for loss to the Owner due to data security and privacy breach, including costs of investigating a potential or actual breach of confidential or private information. *(Indicate applicable limits of coverage or other conditions in the fill point below.)*

« »

[« »] **§ A.2.5.2 Other Insurance**
(List below any other insurance coverage to be provided by the Owner and any applicable limits.)

Coverage	Limits

ARTICLE A.3 CONTRACTOR'S INSURANCE AND BONDS

§ A.3.1 General

§ A.3.1.1 Certificates of Insurance. The Contractor shall provide certificates of insurance acceptable to the Owner evidencing compliance with the requirements in this Article A.3 at the following times: (1) prior to commencement of the Work; (2) upon renewal or replacement of each required policy of insurance; and (3) upon the Owner's written request. An additional certificate evidencing continuation of commercial liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment and thereafter upon renewal or replacement of such coverage until the expiration of the periods required by Section A.3.2.1 and Section A.3.3.1. The certificates will show the Owner as an additional insured on the Contractor's Commercial General Liability and excess or umbrella liability policy or policies.

§ A.3.1.2 Deductibles and Self-Insured Retentions. The Contractor shall disclose to the Owner any deductible or self-insured retentions applicable to any insurance required to be provided by the Contractor.

§ A.3.1.3 Additional Insured Obligations. To the fullest extent permitted by law, the Contractor shall cause the commercial general liability coverage to include (1) the Owner, the Architect, and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions for which loss occurs during completed operations. The additional insured coverage shall be primary and non-contributory to any of the Owner's general liability insurance policies and shall apply to both ongoing and completed operations. To the extent commercially available, the additional insured coverage shall be no less than that provided by Insurance Services Office, Inc. (ISO) forms CG 20 10 07 04, CG 20 37 07 04, and, with respect to the Architect and the Architect's consultants, CG 20 32 07 04.

§ A.3.2 Contractor's Required Insurance Coverage

§ A.3.2.1 The Contractor shall purchase and maintain the following types and limits of insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:
(If the Contractor is required to maintain insurance for a duration other than the expiration of the period for correction of Work, state the duration.)

« »

§ A.3.2.2 Commercial General Liability

§ A.3.2.2.1 Commercial General Liability insurance for the Project written on an occurrence form with policy limits of not less than « » ($ « ») each occurrence, « » ($ « ») general aggregate, and « » ($ « ») aggregate for products-completed operations hazard, providing coverage for claims including

.1 damages because of bodily injury, sickness or disease, including occupational sickness or disease, and death of any person;

.2 personal injury and advertising injury;

.3 damages because of physical damage to or destruction of tangible property, including the loss of use of such property;

.4 bodily injury or property damage arising out of completed operations; and

.5 the Contractor's indemnity obligations under Section 3.18 of the General Conditions.

§ A.3.2.2.2 The Contractor's Commercial General Liability policy under this Section A.3.2.2 shall not contain an exclusion or restriction of coverage for the following:

.1 Claims by one insured against another insured, if the exclusion or restriction is based solely on the fact that the claimant is an insured, and there would otherwise be coverage for the claim.

.2 Claims for property damage to the Contractor's Work arising out of the products-completed operations hazard where the damaged Work or the Work out of which the damage arises was performed by a Subcontractor.

.3 Claims for bodily injury other than to employees of the insured.

.4 Claims for indemnity under Section 3.18 of the General Conditions arising out of injury to employees of the insured.

.5 Claims or loss excluded under a prior work endorsement or other similar exclusionary language.

.6 Claims or loss due to physical damage under a prior injury endorsement or similar exclusionary language.

.7 Claims related to residential, multi-family, or other habitational projects, if the Work is to be performed on such a project.

.8 Claims related to roofing, if the Work involves roofing.

.9 Claims related to exterior insulation finish systems (EIFS), synthetic stucco or similar exterior coatings or surfaces, if the Work involves such coatings or surfaces.

.10 Claims related to earth subsidence or movement, where the Work involves such hazards.

.11 Claims related to explosion, collapse and underground hazards, where the Work involves such hazards.

§ A.3.2.3 Automobile Liability covering vehicles owned, and non-owned vehicles used, by the Contractor, with policy limits of not less than « » ($ « ») per accident, for 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.

§ A.3.2.4 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 such primary and excess or umbrella insurance policies result in the same or greater coverage as the coverages required under Section A.3.2.2 and A.3.2.3, and in no event shall any excess or umbrella liability insurance provide narrower coverage than the primary policy. The excess policy shall not require the exhaustion of the underlying limits only through the actual payment by the underlying insurers.

§ A.3.2.5 Workers' Compensation at statutory limits.

§ A.3.2.6 Employers' Liability with policy limits not less than « » ($ « ») each accident, « » ($ « ») each employee, and « » ($ « ») policy limit.

§ A.3.2.7 Jones Act, and the Longshore & Harbor Workers' Compensation Act, as required, if the Work involves hazards arising from work on or near navigable waterways, including vessels and docks

§ A.3.2.8 If the Contractor is required to furnish professional services as part of the Work, the Contractor shall procure Professional Liability insurance covering performance of the professional services, with policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate.

§ A.3.2.9 If the Work involves the transport, dissemination, use, or release of pollutants, the Contractor shall procure Pollution Liability insurance, with policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate.

§ A.3.2.10 Coverage under Sections A.3.2.8 and A.3.2.9 may be procured through a Combined Professional Liability and Pollution Liability insurance policy, with combined policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate.

§ A.3.2.11 Insurance for maritime liability risks associated with the operation of a vessel, if the Work requires such activities, with policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate.

§ A.3.2.12 Insurance for the use or operation of manned or unmanned aircraft, if the Work requires such activities, with policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate.

§ A.3.3 Contractor's Other Insurance Coverage

§ A.3.3.1 Insurance selected and described in this Section A.3.3 shall be purchased from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:
(If the Contractor is required to maintain any of the types of insurance selected below for a duration other than the expiration of the period for correction of Work, state the duration.)

« »

§ A.3.3.2 The Contractor shall purchase and maintain the following types and limits of insurance in accordance with Section A.3.3.1.
(Select the types of insurance the Contractor is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. Where policy limits are provided, include the policy limit in the appropriate fill point.)

[« »] **§ A.3.3.2.1** Property insurance of the same type and scope satisfying the requirements identified in Section A.2.3, which, if selected in this section A.3.3.2.1, relieves the Owner of the responsibility to purchase and maintain such insurance except insurance required by Section A.2.3.1.3 and Section A.2.3.3. The Contractor shall comply with all obligations of the Owner under Section A.2.3 except to the extent provided below. The Contractor shall disclose to the Owner the amount of any deductible, and the Owner shall be responsible for losses within the deductible. Upon request, the Contractor shall provide the Owner with a copy of the property insurance policy or policies required. The Owner shall adjust and settle the loss with the insurer and be the trustee of the proceeds of the property insurance in accordance with Article 11 of the General Conditions unless otherwise set forth below:
(Where the Contractor's obligation to provide property insurance differs from the Owner's obligations as described under Section A.2.3, indicate such differences in the space below. Additionally, if a party other than the Owner will be responsible for adjusting and settling a loss with the insurer and acting as the trustee of the proceeds of property insurance in accordance with Article 11 of the General Conditions, indicate the responsible party below.)

« »

[« »] **§ A.3.3.2.2 Railroad Protective Liability Insurance**, with policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate, for Work within fifty (50) feet of railroad property.

[« »] **§ A.3.3.2.3 Asbestos Abatement Liability Insurance**, with policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate, for liability arising from the encapsulation, removal, handling, storage, transportation, and disposal of asbestos-containing materials.

[« »] **§ A.3.3.2.4** Insurance for physical damage to property while it is in storage and in transit to the construction site on an "all-risks" completed value form.

[« »] **§ A.3.3.2.5** Property insurance on an "all-risks" completed value form, covering property owned by the Contractor and used on the Project, including scaffolding and other equipment.

[« »] **§ A.3.3.2.6 Other Insurance**
(List below any other insurance coverage to be provided by the Contractor and any applicable limits.)

Coverage	Limits

§ A.3.4 Performance Bond and Payment Bond

The Contractor shall provide surety bonds, from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located, as follows:
(Specify type and penal sum of bonds.)

Type	Penal Sum ($0.00)
Payment Bond	
Performance Bond	

Payment and Performance Bonds shall be AIA Document A312™, Payment Bond and Performance Bond, or contain provisions identical to AIA Document A312™, current as of the date of this Agreement.

ARTICLE A.4 SPECIAL TERMS AND CONDITIONS

Special terms and conditions that modify this Insurance and Bonds Exhibit, if any, are as follows:

« »

Appendix H

Draft AIA Document A201
General Conditions of the Contract for Construction

DRAFT

AIA® Document A201® – 2017

General Conditions of the Contract for Construction

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

« »
« »

THE OWNER:
(Name, legal status and address)

« »« »
« »

THE ARCHITECT:
(Name, legal status and address)

« »« »
« »

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.
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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.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set

forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

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

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

§ 2.2 Evidence of the Owner's Financial Arrangements

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

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the 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.

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

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

§ 3.11 Documents and Samples at the Site

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

§ 3.12 Shop Drawings, Product Data and Samples

§ 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.

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

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

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

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

§ 15.3 Mediation

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

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

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

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

§ 15.4 Arbitration

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

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

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

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 Consolidation or Joinder

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

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

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

SAVOONGA REINDEER PROCESSING FACILITY

ST LAWRENCE ISLAND

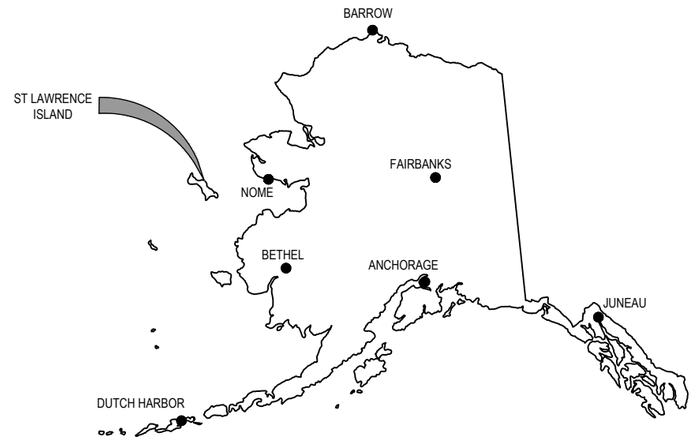
COFFMAN ENGINEERS

KAWERAK, INC.

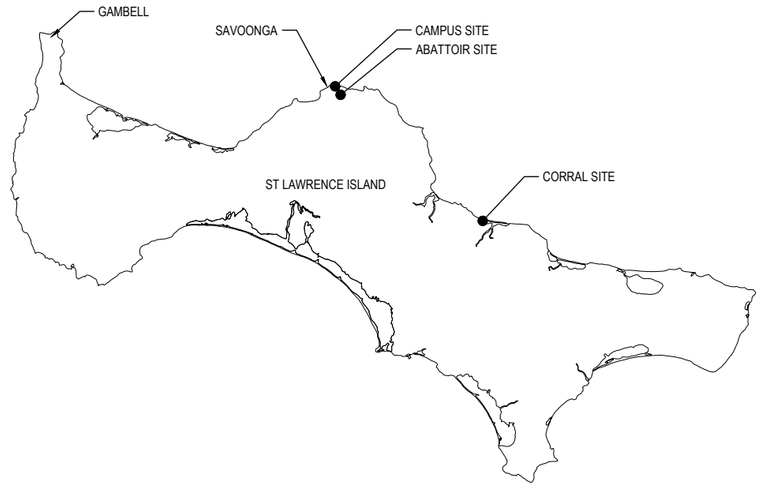
SAVOONGA REINDEER COMMERCIAL COMPMANY

MCG EXPLORE DESIGN

EDA PROJECT NUMBER
07 79 07873



1 G-001 LOCATION MAP
SCALE: NTS
NORTH



2 G-001 VICINITY MAP
SCALE: NTS
NORTH

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KAWERAK, INC.

SAVOONGA REINDEER PROCESSING FACILITY

BID DOCUMENTS

REV	DATE	DESCRIPTION
1	3/18/24	EDA REVISIONS

PROJ. NO.	231585
DRAWN	RJG
CHECKED	AJW
DATE	12/15/2023

SHEET TITLE:
TITLE SHEET

SHEET NO:
G-001

SAVOONGA REINDEER PROCESSING FACILITY

ST LAWRENCE ISLAND

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E-602	ELECTRICAL SCHEDULES
E-603	ELECTRICAL SCHEDULES

CAMPUS SITE

ABATTOIR SITE

CORRAL SITE

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KAWERAK

KAWERAK, INC.

SAVOONGA REINDEER PROCESSING FACILITY

BID DOCUMENTS

REV	DATE	DESCRIPTION

PROJ. NO.	231585
DRAWN	RJG
CHECKED	AJW
DATE	12/15/2023

SHEET TITLE:

SHEET INDEX & PROJECT LOCATIONS

SHEET NO:

G-002

LEGEND:

EXISTING	NEW	
		PROPERTY LINE
		EASEMENT
		CENTERLINE
		STRUCTURE
W	W	WATERLINE
WS	WS	WATER & SEWER SERVICE
U	U	UTILIDOR
OHE	OHE	OVERHEAD ELECTRIC
		EDGE OF GRAVEL
150.00	150.00 XX	SPOT GRADE ELEVATION
		CONCRETE
		UTILITY POLE
		SIGN
140	140	ELEVATION CONTOUR
		TREELINE

ELEVATION CALLOUT LEGEND:

150.00 FG	FINISH GRADE ELEVATION
150.00 FL	FLOW LINE ELEVATION
150.00 TC	TOP OF CONCRETE ELEVATION
150.00 EG	EXISTING GRADE

SURVEY CONTROL & PROPERTY DATA:

S1. EXISTING SURVEY INFORMATION SHOWN BASED ON SURVEY BY MCCLINTOCK LAND ASSOCIATES, INC. IN AUGUST 2023.

S2. BASIS OF BEARING: TBD

S3. ELEVATIONS DATA: TBD

S4. LEGAL DESCRIPTION:

S5. PROPERTY AREA XX ACRES.

S6. SURVEY DATE: AUGUST 2023

ABBREVIATIONS:

&	AND
℄	CENTERLINE
Ø	DIAMETER
#	NUMBER
%	PERCENT
℗	PROPERTY LINE
AASHTO	AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
AC	ASPHALT CONCRETE
AD	AREA DRAIN
ADA	AMERICANS WITH DISABILITIES ACT
ADEC	ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION
ADOT&PF	ALASKA DEPARTMENT OF TRANSPORTATION & PUBLIC FACILTIES
AFD	ANCHORAGE FIRE DEPARTMENT
BLDG	BUILDING
BOC	BACK OF CURB
BOP	BOTTOM OF PIPE
BOT	BOTTOM
C&G	CURB AND GUTTER
CB	CATCH BASIN
CIP	CAST IRON PIPE
CMP	CORRUGATED METAL PIPE
CO	CLEAN OUT
COMM	UNDERGROUND COMMUNICATION
CONC	CONCRETE
CPEP	CORRUGATED POLYETHYLENE PIPE
CU	COPPER
DCPM	DESIGN AND CONSTRUCTION PRACTICES MANUAL
DIP	DUCTILE IRON PIPE
E	EAST
(E)	EXISTING
EL	ELEVATION
EOC	EDGE OF CONCRETE
EP	EDGE OF PAVEMENT
EW	EACH WAY
FOC	FACE OF CURB
FL	FLOW LINE
FH	FIRE HYDRANT
FF	FINISH FLOOR
FDC	FIRE DEPARTMENT CONNECTION
FG	FINISH GRADE
FT	FEET
GB	GRADE BREAK
H	HEIGHT
HBO	HEADBOLT OUTLET
HDPE	HIGH DENSITY POLYETHYLENE
HORIZ	HORIZONTAL
HP	HIGH POINT
IFC	INTERNATIONAL FIRE CODE
IN	INCH
INV	INVERT
LONG	LONGITUDINAL
MAX	MAXIMUM
ME	MATCH EXISTING
MH	MANHOLE
MIN	MINIMUM
N	NORTH
NE	NORTHEAST
NIC	NOT IN CONTRACT
NW	NORTHWEST
OHE	OVERHEAD ELECTRIC
O.D.	OUTSIDE DIAMETER
POC	POINT OF CONNECTION
PCC	PORTLAND CEMENTUOUS CONCRETE
PSI	POUNDS PER SQUARE INCH
R&R	REMOVE AND REPLACE
REC	RECORD
REINF	REINFORCING
REQ'D	REQUIRED
S	SEWER, SOUTH
SD	STORM DRAIN
SE	SOUTHEAST
SEC	SECTION
SF	SQUARE FEET
SSMH	SANITARY SEWER MANHOLE
STA	STATION
STL	STEEL
SW	SOUTHWEST
TB	TEST BORING
TBC	TOP BACK OF CURB
TC	TOP OF CONCRETE
TH	TEST HOLE
TYP	TYPICAL
UGE	UNDERGROUND ELECTRIC
V.B.	VALVE BOX
VERT	VERTICAL
W	WATER, WEST
W/	WITH

GENERAL NOTES:

G1. ALL SITEWORK CONSTRUCTION SHALL BE IN CONFORMANCE WITH THE DESIGN DRAWINGS AND PROJECT SPECIFICATIONS.

G2. CAUTION, EXISTING UTILITIES SHOWN ARE NOT COMPREHENSIVE. CONTRACTOR SHALL VERIFY LOCATION OF ALL UTILITIES PRIOR TO EXCAVATION/CONSTRUCTION, AND SHALL CALL FOR UTILITY LOCATES A MINIMUM OF TWO UTILITY WORKING DAYS PRIOR TO EXCAVATION.

G3. ALL FILL MATERIAL SHALL BE PLACED IN LIFTS NO THICKER THAN 12 INCHES, AND COMPACTED TO 95% UNLESS INDICATED OTHERWISE. COMPACTION SHALL BE DETERMINED BY AASHTO T-180-d.

G4. CONTRACTOR SHALL MEET ALL OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (O.S.H.A.) SAFETY STANDARDS AND BE RESPONSIBLE FOR SAFETY MATTERS ON AND AROUND THE JOB SITE.

G5. THE CONTRACTOR SHALL BE RESPONSIBLE FOR EROSION AND SEDIMENT CONTROLS AS NECESSARY TO COMPLY WITH FEDERAL, STATE, AND LOCAL LAWS THAT PROHIBIT NON-PERMITTED DISCHARGE OF POLLUTANTS, INCLUDING SEDIMENTS, THAT ARE A RESULT OF EROSION AND OTHER CONSTRUCTION ACTIVITIES. THE CONTRACTOR SHALL CONDUCT ALL WORK SO SEDIMENT IS NOT TRANSPORTED ONTO THE ROADWAY OR ADJACENT PROPERTY.

G6. THE CONTRACTOR SHALL RESTORE ALL DISTURBED PROPERTY AFFECTED DISTURBED BY CONTRACT ACTIVITIES TO PRE-CONSTRUCTION CONDITION OR AS INDICATED ON THE PLANS.

CIVIL SPECIFICATIONS:

SCOPE OF WORK:

1. FURNISH AND INSTALL ALL MATERIALS AND EQUIPMENT AS REQUIRED FOR COMPLETE FABRICATION AND INSTALLATION OF THE CIVIL PORTION OF THIS PROJECT AS INDICATED ON THE DRAWINGS TO PROVIDE A FULLY-FUNCTIONING INSTALLATION OF THE UTILITIES. REFER TO THE DRAWINGS OF ALL DISCIPLINES FOR ADDITIONAL REQUIREMENTS AFFECTING THIS WORK.

2. THE BASIC SCOPE OF WORK INCLUDES ALL SITE PREPARATION NEEDED FOR THE CONSTRUCTION OF THE PROPOSED STRUCTURES AND IMPROVEMENTS INCLUDING WATER AND SEWER SERVICES AND CONNECTIONS TO EXISTING WATER AND SEWER SERVICE, AND ALL OTHER WORK INDICATED IN THE PLANS.

GENERAL REQUIREMENTS FOR THE WORK:

1. STANDARDS, CODES AND REGULATIONS: WORK SHALL COMPLY WITH THE LATEST ADOPTED EDITION OF THE INTERNATIONAL MECHANICAL CODE (IMC), UNIFORM PLUMBING CODE (UPC), INTERNATIONAL BUILDING CODE (IBC), NATIONAL ELECTRICAL CODE (NEC), AND INTERNATIONAL FIRE CODE (IFC) INCLUDING ALL STATE AND LOCAL AMENDMENTS TO THESE CODES. ALSO ANY OTHER APPLICABLE FEDERAL, STATE, AND LOCAL CODES AND REQUIREMENTS INCLUDING ALL SAFETY CODES.

2. DRAWINGS: THE DRAWINGS ARE DIAGRAMMATIC, NOT NECESSARILY SHOWING ALL OFFSETS OR EXACT LOCATIONS OF FIXTURES, EQUIPMENT, ETC., UNLESS SPECIFICALLY DIMENSIONED. REVIEW THE DRAWINGS AND SPECIFICATIONS FOR EQUIPMENT FURNISHED BY OTHER CRAFTS BUT INSTALLED IN ACCORDANCE WITH THIS SECTION. BRING QUESTIONABLE OR OBSCURE ITEMS, APPARENT CONFLICTS BETWEEN PLANS, SPECIFICATIONS, GOVERNING CODES AND/OR UTILITIES REGULATIONS TO THE ATTENTION OF THE OWNER. CODES, ORDINANCES, REGULATIONS, MANUFACTURER'S INSTRUCTIONS OR STANDARDS TAKE PRECEDENCE WHEN THEY ARE MORE STRINGENT OR CONFLICT WITH THE DRAWINGS AND SPECIFICATIONS.

3. RECORD DRAWINGS: MARK UP A CLEAN SET OF DRAWINGS AS THE WORK PROGRESSES TO SHOW THE DIMENSIONED LOCATION AND ROUTING OF ALL CIVIL WORK. SHOW COMPLETE ROUTING AND SIZING OF REVISIONS TO THE SYSTEMS SHOWN.

4. APPROVED-EQUAL EQUIPMENT: EQUIPMENT SHOWN OR SPECIFIED ON THE DRAWINGS WAS USED AS THE BASIS-OF-DESIGN. DIFFERENT MAKES, MODELS AND MANUFACTURERS MAY BE PROVIDED WHEN THE SUBSTITUTE IS OF SUBSTANTIALLY THE SAME FUNCTION, QUALITY, RELIABILITY, ETC. AND HAS BEEN SUBMITTED AND APPROVED BY THE OWNER AS AN EQUIVALENT PRODUCT.

5. ALL EXCAVATED ORGANIC OR OTHER UNSUITABLE BACKFILL MATERIALS SHALL BE PLACED IN SIMILAR MANNER, BUT SHALL BE KEPT SEPARATE FROM ALL EXCAVATED SANDY, SILTY, OR GRAVELLY MATERIAL. IN ADDITION, EXCAVATED MATERIALS SUITABLE FOR BEDDING, SHALL BE STOCKPILED SEPARATE FROM EACH OTHER.

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www.coffman.com AECC249

STATE OF ALASKA 49TH
Michael A. Fabian
Dec. 15, 2023
No. CE11057
REGISTERED PROFESSIONAL ENGINEER

KAWERAK
KAWERAK, INC.

SAVOONGA REINDEER PROCESSING FACILITY

BID DOCUMENTS

REV	DATE	DESCRIPTION

PROJ. NO.	231585
DRAWN	DST
CHECKED	MAF
DATE	12/15/2023

SHEET TITLE:

GENERAL NOTES, LEGEND, & ABBREVIATIONS

SHEET NO:

C-001

1 C-002 VICINITY MAP
SCALE: 1" = 2000'-0"

NORTH

0 3000 6000 12000 18000
1"=6000'-0"

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ph 907.276.6664
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STATE OF ALASKA
49TH
Michael A. Fabian
Dec. 15, 2023
No. CE11057
REGISTERED PROFESSIONAL ENGINEER

KAWERAK

KAWERAK, INC.

SAVOONGA REINDEER PROCESSING FACILITY

BID DOCUMENTS

REV	DATE	DESCRIPTION

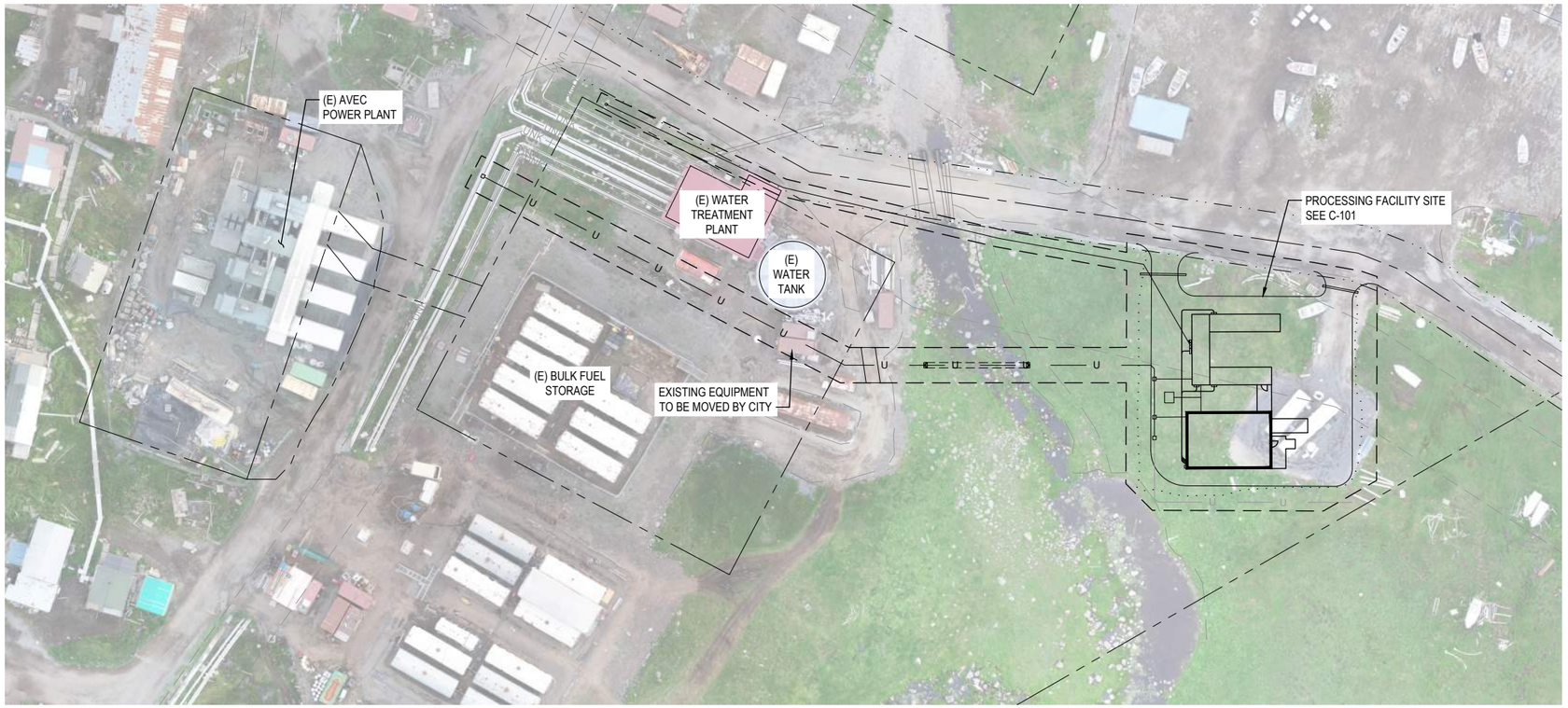
PROJ. NO.	231585
DRAWN	DST
CHECKED	MAF
DATE	12/15/2023

SHEET TITLE:

VICINITY MAP

SHEET NO:

C-002



1
C-100

OVERALL PROCESSING FACILITY SITE PLAN

SCALE: 1" = 40'-0"

NORTH

0 20 40 80 120

1"=40'-0"

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STATE OF ALASKA
49TH
Michael A. Fuller
Dec 15, 2023
No. CE11057
REGISTERED PROFESSIONAL ENGINEER

KAWERAK

KAWERAK, INC.

SAVOONGA
REINDEER
PROCESSING
FACILITY

BID DOCUMENTS

REV	DATE	DESCRIPTION

PROJ. NO.	231585
DRAWN	DST
CHECKED	MAF
DATE	12/15/2023

SHEET TITLE:

OVERALL
PROCESSING
FACILITY SITE
PLAN

SHEET NO:

C-100

SHEET NOTES:

1. SEE 1/C-500 FOR TYPICAL PAD SECTION.
2. CONTRACTOR SHALL RESTORE ALL DISTURBED AREAS WITH SEED MIX TYPE A, SEE LANDSCAPE.
3. ACCESS TO THE MODULES WILL BE PROVIDED BY THE MODULAR MANUFACTURER.

PROPOSED AS-BUILT ROAD ACCESS EASEMENT.
(E) UTILITY POLE
(E) CULVERT TO REMAIN UNDISTURBED
(E) CULVERTS TO REMAIN UNDISTURBED
APPROXIMATE CENTERLINE OF (E) GRAVEL ROAD/EASEMENT
APPROXIMATE EDGE OF (E) GRAVEL ROAD
(E) BEACH ACCESS
UTILITY POLE W/ TRANSFORMER BANK. SEE ELECTRICAL.
(E) WATER TREATMENT PLANT
UTILITY POLE (BY OTHERS)
(E) WATER TANK
12" CMP DRIVEWAY CULVERT (TYP OF 2). SEE 3/C-500
DITCH AND GRADE TO DRAIN BETWEEN CULVERTS
WATER & SEWER MAIN UTILIDOR. SEE C-200
UTILIDOR BRIDGE PILE (TYP OF 3 AT EACH END). SEE STRUCTURAL
(E) DRAINAGE
GRADE TO DRAIN
SERVICE DISCONNECT, SEE ELECTRICAL
WATER & SEWER SERVICE. SEE C-201
PROCESSING MODULES FF=23.5'
MODULE ACCESS. SEE NOTE 4
GRAVEL PAD. SEE 1/C-500
UTILIDOR GRADING, SEE 2/C-200 AND 3/C-500
GRAVEL RAMP UTILIDOR CROSSING, MOUND OVER UTILIDOR WITH GRAVEL, MIN. 12" COVER WITH 1:12 SLOPE, 8' WIDE.
UTILIDOR BRIDGE AT DRAINAGE CROSSING. SEE STRUCTURAL.
FUEL OIL SUPPLY & RETURN. SEE 4/C-500
1000 GAL FUEL TANK (FT-1) & FOUNDATION. SEE 5/C-500
TOE OF FILL
2H:1V SIDESLOPE (TYP)
STORAGE BUILDING FF=23.5'
(E) GROUND CONTOUR (TYP)
WATER & SEWER SERVICE. SEE C-201
(E) ROAD EASEMENT TO BE UPDATED TO AS-BUILT LOCATION.
CUT TO CULVERT INLET, 2:1 MAX SLOPE
PROPOSED EDA LEASE LOT BOUNDARY (TYP)
FUTURE UTILIDOR WITH WATER & SEWER SERVICE (BY OTHERS)
PROPERTY LINE (TYP)

1 C-101 PROCESSING FACILITY SITE & GRADING PLAN
SCALE: 1" = 20'-0"

NORTH

1"=20'-0" 0 10 20 40 60

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STATE OF ALASKA 49TH — Michael A. Fallon — Dec 15, 2023 — No. CE11057 — REGISTERED PROFESSIONAL ENGINEER

KAWERAK

KAWERAK, INC.

SAVOONGA REINDEER PROCESSING FACILITY

BID DOCUMENTS

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SHEET TITLE:

PROCESSING FACILITY SITE & GRADING PLAN

SHEET NO:

C-101

CONTROL POINT TABLE			
POINT #	NORTHING	EASTING	DESCRIPTION
P200	3537793.30	1568413.80	BEGIN GRAVEL ACCESS ROAD
P201	3537711.87	1568422.52	PC
P202	3537628.10	1568444.02	POC, R=300'
P203	7553.95	1568488.52	PT
P204	4.14	1568627.29	PI
P205	2	1568967.73	PI
	1	1569131.00	PI
P207		1569280.41	PI
P208	3536225.0	1569605.21	PI
P209	3535835.84	1569853.77	PI
0	3535563.58	1570119.46	PI
P211	3535284.55	1570322.20	END GRAVE

SHEET NOTES:

1. PRIOR TO CONSTRUCTION, CONTRACTOR SHALL FLAG ROAD ALIGNMENT AND ABATTOIR SITE FOR OWNER APPROVAL. CONTRACTOR SHALL NOTIFY OWNER A MINIMUM 14 DAYS REQUESTING APPROVAL.
2. CONTRACTOR SHALL RESTORE ALL DISTURBED AREAS WITH SEED MIX TYPE A, SEE LANDSCAPE.

1 C-102 NORTH

ABATTOIR ACCESS ROAD AND SITE PLAN

SCALE: 1" = 200'-0"

0 100 200 400 600
1"=200'-0"

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SHEET TITLE:

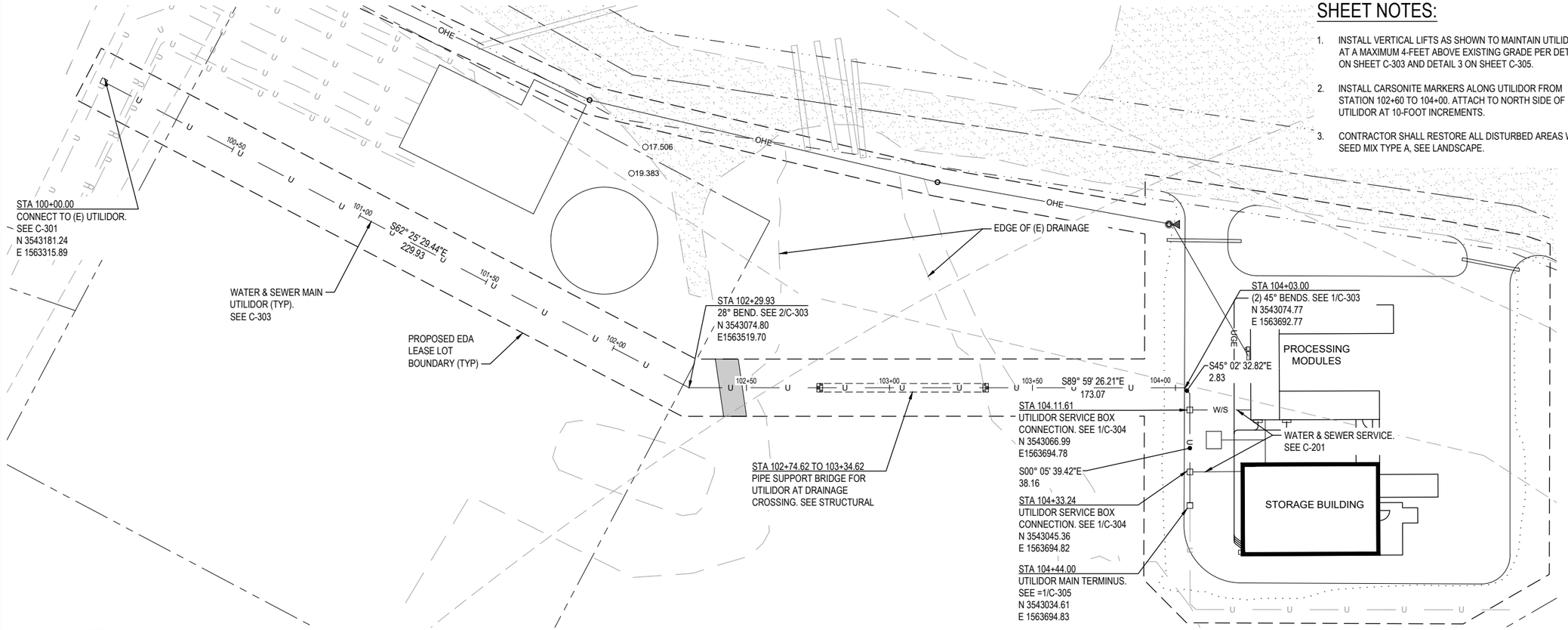
ABATTOIR ACCESS ROAD AND SITE PLAN

SHEET NO:

C-102

SHEET NOTES:

1. INSTALL VERTICAL LIFTS AS SHOWN TO MAINTAIN UTILIDOR AT A MAXIMUM 4-FEET ABOVE EXISTING GRADE PER DETAIL 3 ON SHEET C-303 AND DETAIL 3 ON SHEET C-305.
2. INSTALL CARSONITE MARKERS ALONG UTILIDOR FROM STATION 102+60 TO 104+00. ATTACH TO NORTH SIDE OF UTILIDOR AT 10-FOOT INCREMENTS.
3. CONTRACTOR SHALL RESTORE ALL DISTURBED AREAS WITH SEED MIX TYPE A, SEE LANDSCAPE.

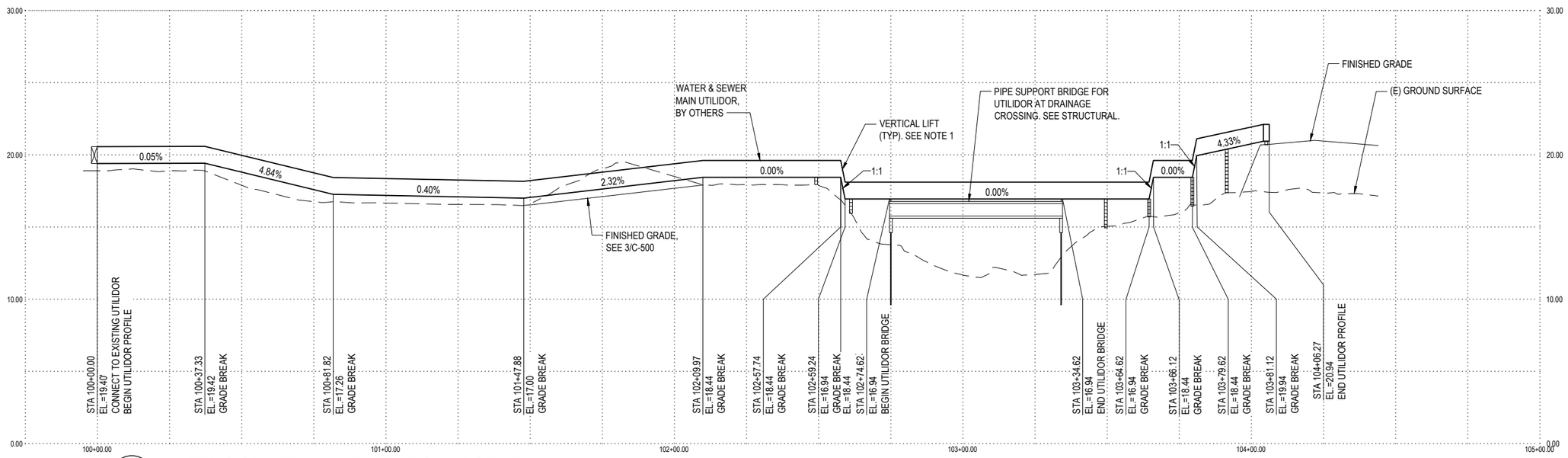


1 C-200 WATER & SEWER MAIN EXTENTION PLAN
SCALE: 1" = 20'-0"

NORTH

1"=20'-0" 0 10 20 40 60

1"=5'-0" 0 5 10 15



2 C-200 WATER & SEWER MAIN EXTENTION PROFILE
SCALE: 1" = 5'-0"

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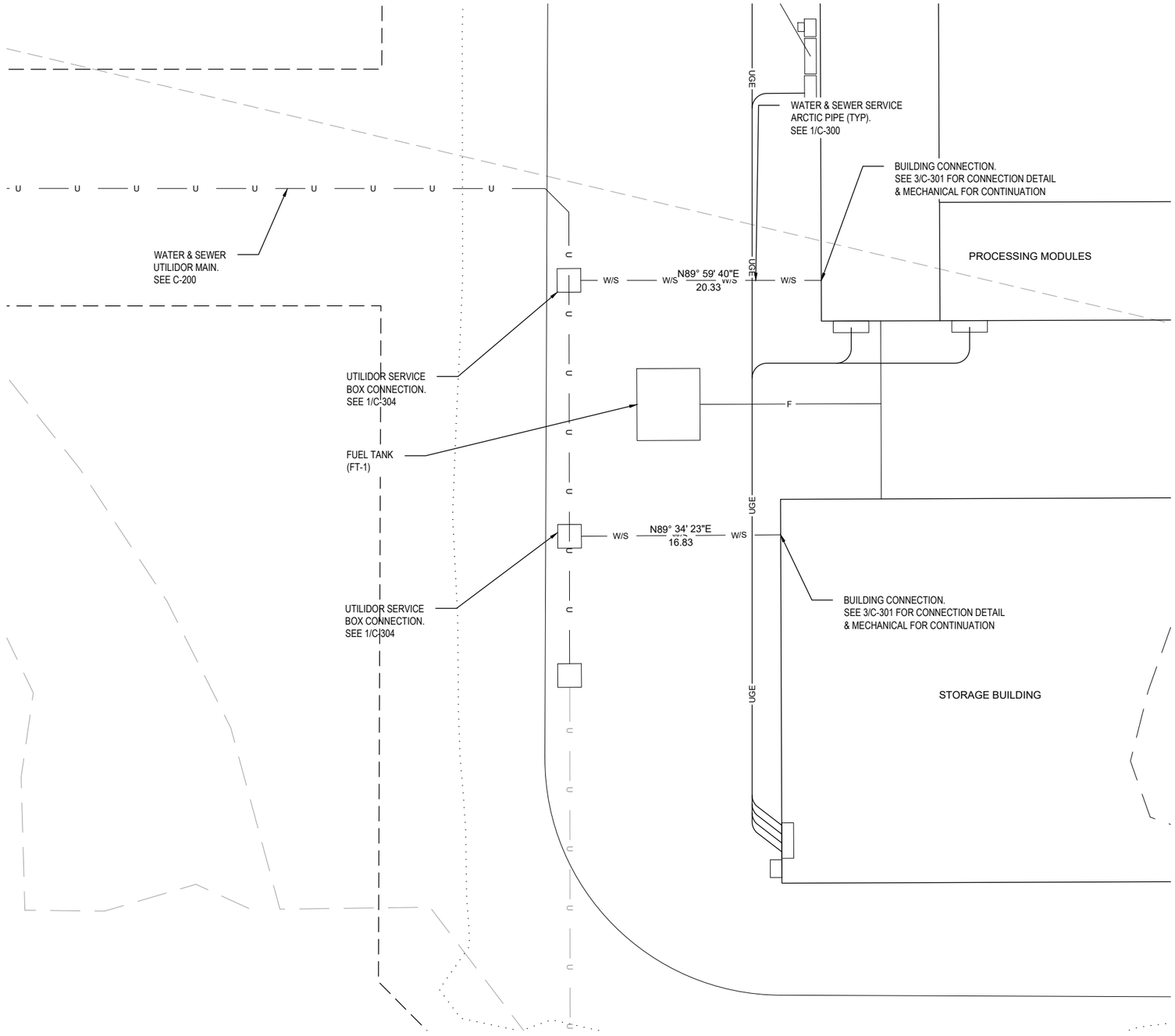
SHEET TITLE:

WATER & SEWER
MAIN EXTENSION
PLAN & PROFILE

SHEET NO:

C-200



1 C-201 WATER & SEWER SERVICE PLAN
SCALE: 1" = 5'-0"

1"=5'-0" 0 5 10 15

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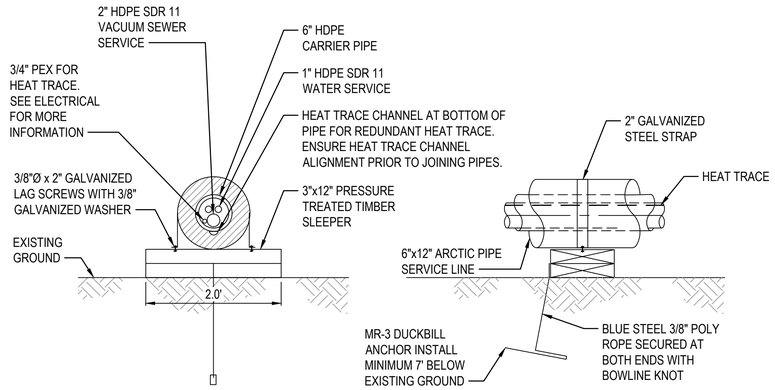
SHEET TITLE:

WATER & SEWER
SERVICE PLAN

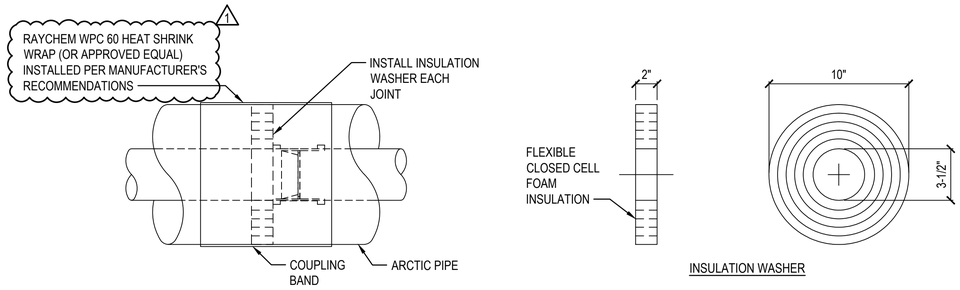
SHEET NO:

C-201



1 C–300 WATER & SEWER ARCTIC PIPE SERVICE LINE

SCALE: NTS



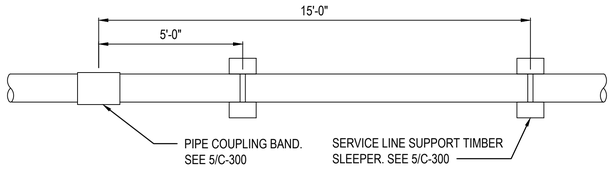
NOTES

1. THIS DETAIL APPLIES TO ALL WATER SERVICE PIPE AND FITTING JOINTS UNLESS SPECIFIED OTHERWISE.
2. INSULATE EXPOSED PIPE PER MANUFACTURER'S RECOMMENDATIONS.
3. ENSURE HEAT TRACE CHANNEL ALIGNMENT PRIOR TO JOINING PIPES.

2 C–300 ARCTIC PIPE JOINT CONNECTION

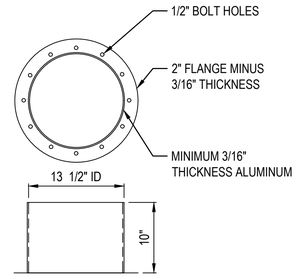
SCALE: NTS

BID DOCUMENTS



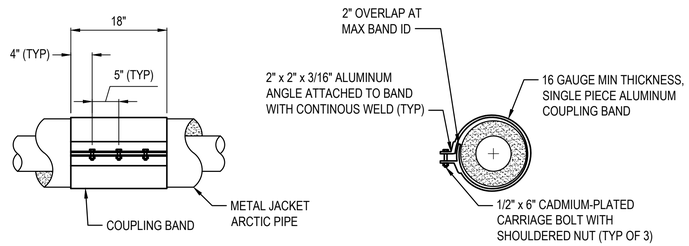
3 C–300 SERVICE LINE SUPPORT SPACING

SCALE: NTS



4 C–300 SERVICE BOX COLLAR

SCALE: NTS



5 C–300 PIPE COUPLING BAND

SCALE: NTS

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FACILITY

PERMIT DOCUMENTS

REV	DATE	DESCRIPTION
1	03/18/2024	EDA REVISIONS

PROJ. NO.	231585
DRAWN	DST
CHECKED	MAF
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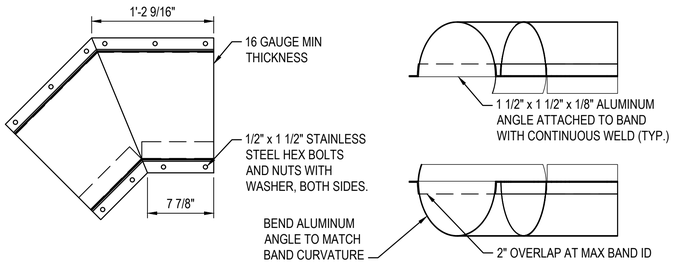
SHEET TITLE:

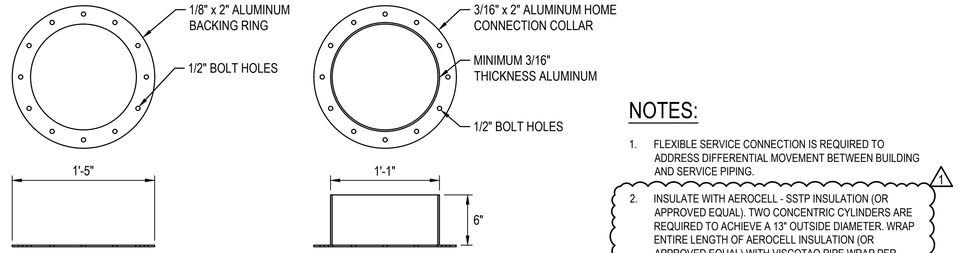
ARCTIC PIPE
DETAILS

SHEET NO:

C-300



1 C–301 45 DEGREE ELBOW BAND
SCALE: NTS

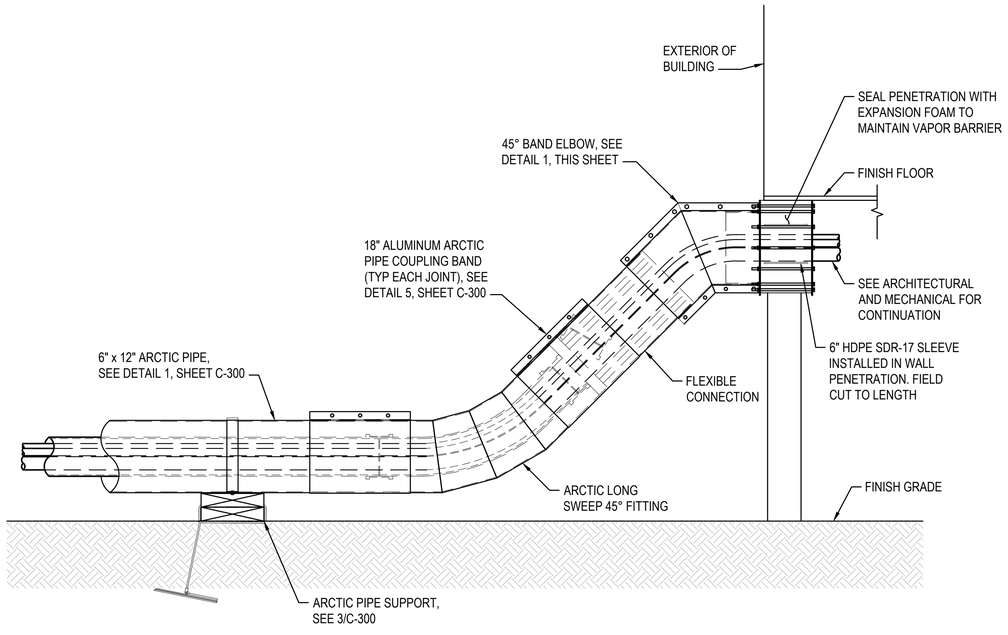


NOTES:

1. FLEXIBLE SERVICE CONNECTION IS REQUIRED TO ADDRESS DIFFERENTIAL MOVEMENT BETWEEN BUILDING AND SERVICE PIPING.
2. INSULATE WITH AEROCELL - SSTP INSULATION (OR APPROVED EQUAL). TWO CONCENTRIC CYLINDERS ARE REQUIRED TO ACHIEVE A 13" OUTSIDE DIAMETER. WRAP ENTIRE LENGTH OF AEROCELL INSULATION (OR APPROVED EQUAL) WITH VISCOTAQ PIPE WRAP PER MANUFACTURER'S RECOMMENDATIONS. WRAP VISCOTAQ-ST WITH VISCOTAQ PE OUTER WRAP FROM BOTTOM-UP TO ENSURE PROTECTION FROM WATER. 1

BID DOCUMENTS

2 C–301 BUILDING CONNECTION COLLAR AND BACKING RING
SCALE: NTS



3 C–301 ARTIC PIPE FLEXIBLE SERVICE SECTION
SCALE: NTS

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STATE OF ALASKA 49TH Michael A. Frison Dec 15, 2023 No. CE11057 REGISTERED PROFESSIONAL ENGINEER

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SHEET TITLE:

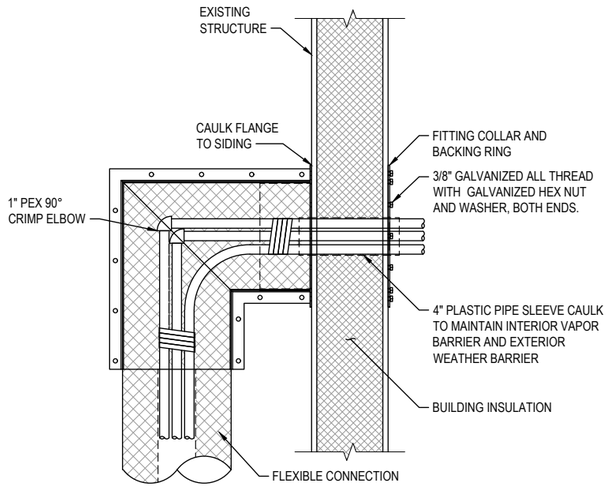
ARCTIC PIPE UTILITY SERVICE DETAILS

SHEET NO:

C-301

NOTES:

1. ATTACH HEAT TAPE CONDUIT TO WATER LINES WITH GORILLA TAPE, OR EQUAL.
2. INSULATE INSIDE ELBOW WITH AEROCEL SHEET INSULATION.



1 / C–302 SERVICE LINE HOUSE CONNECTION
SCALE: NTS

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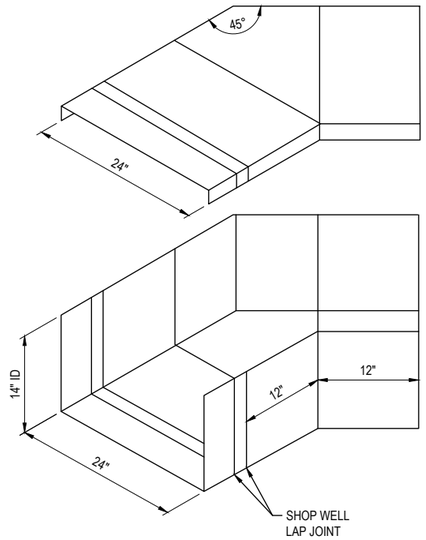
SHEET TITLE:

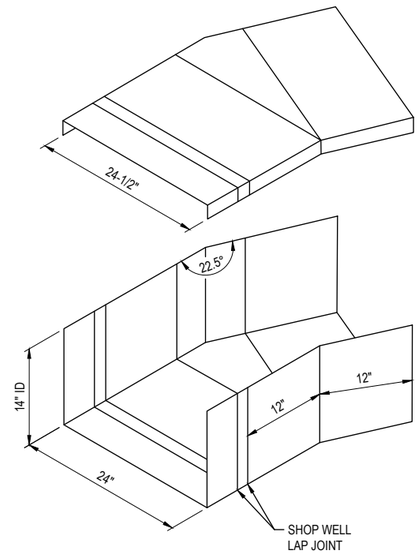
ARCTIC CIRCULATING WATER SERVICE CONNECTION

SHEET NO:

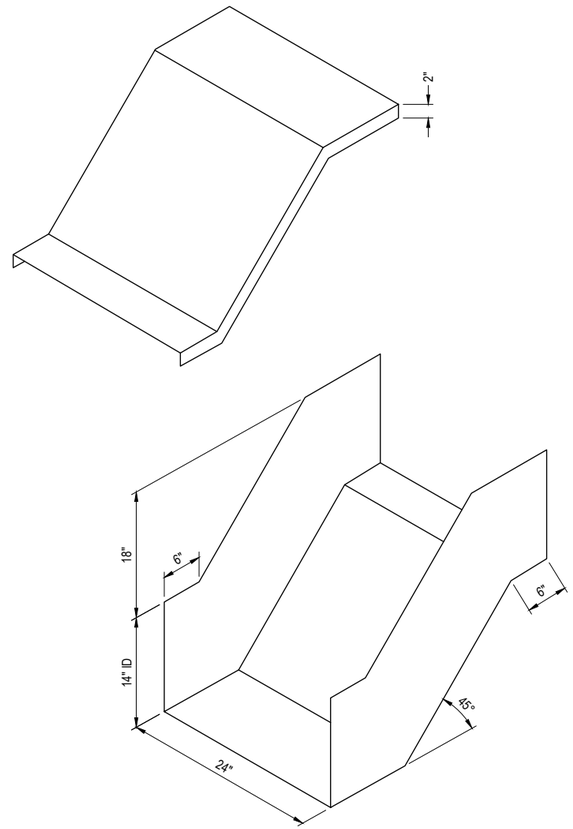
C-302



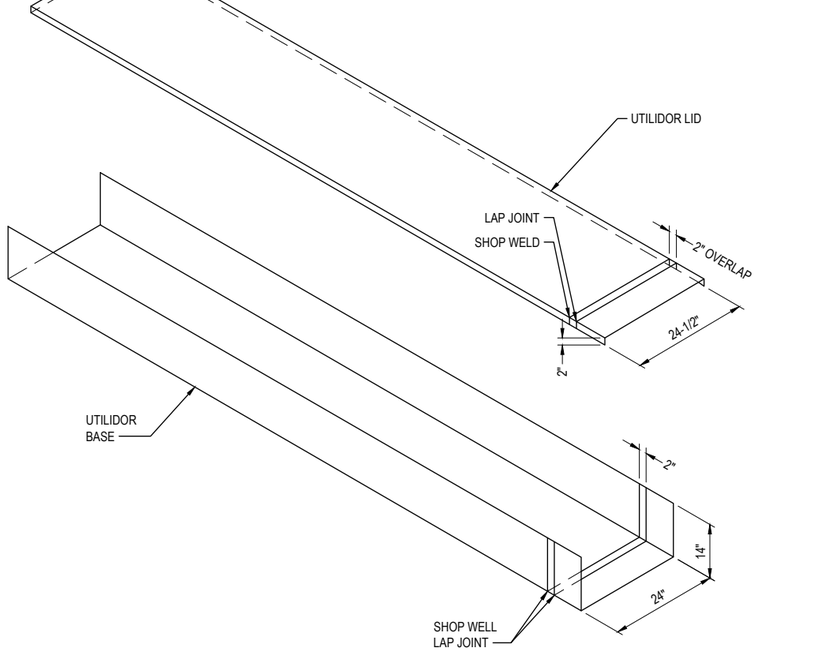
1 C–303 UTILIDOR 45 DEGREE FABRICATION
SCALE: NTS



2 C–303 UTILIDOR 22.5 DEGREE FABRICATION
SCALE: NTS



3 C–303 UTILIDOR LIFT FABRICATION
SCALE: NTS



4 C–303 UTILIDOR ISO VIEW
SCALE: NTS

SHEET NOTES:

1. ALL MATERIAL SHALL BE 0.125 INCH. 5052-H32 ALUMINUM.
2. ALL DIMENSIONS OUTLINED ARE INTERNAL DIMENSIONS.
3. LAP JOINTS ON THE BASE SECTION ARE INTERNAL, LAP JOINTS ON THE LID SECTION ARE EXTERNAL.
4. SECURE UTILIDOR LIDS TO BASE ALONG SIDES WITH HOT DIP GALVANIZED SELF-DRILLING SCREWS #12 x 1" WITH INTEGRAL EPDM BONDED SEALING WASHER AT 18" O.C. (TYP).

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STATE OF ALASKA 49TH
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Dec 15, 2023
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KAWERAK

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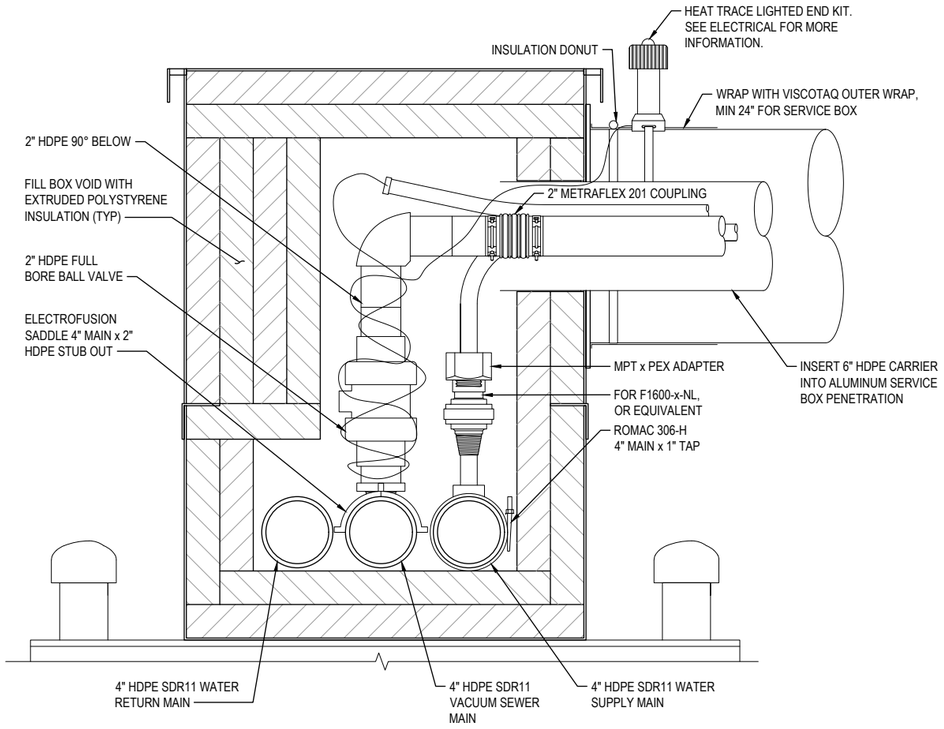
SHEET TITLE:

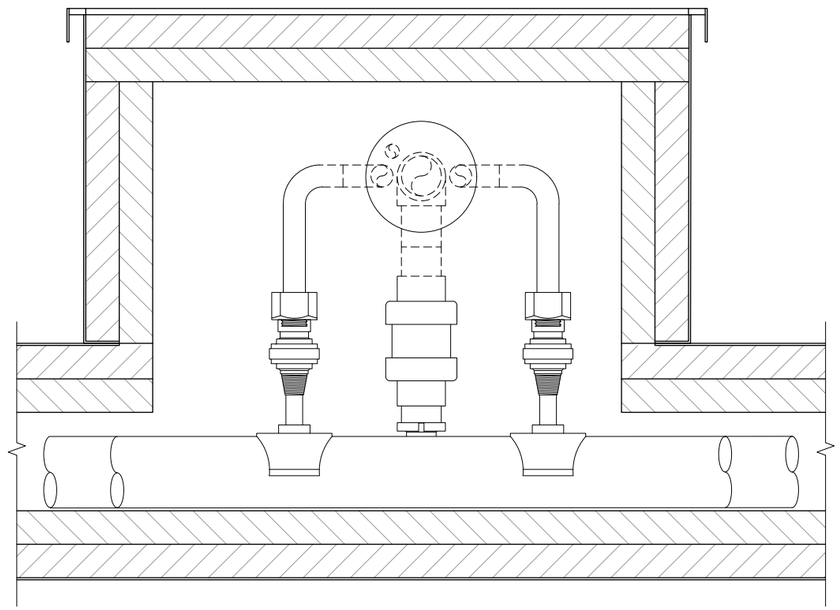
UTILIDOR
DETAILS

SHEET NO:

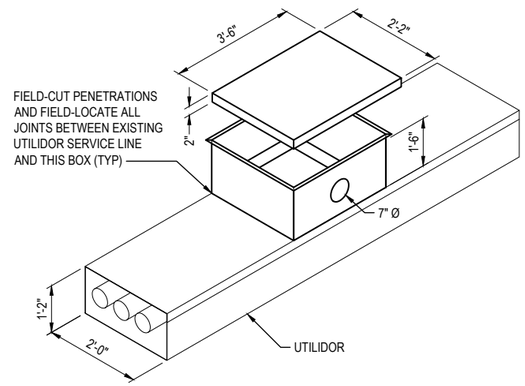
C-303



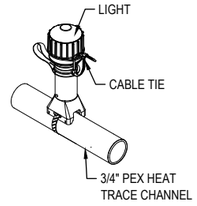
1 C–304 UTILIDOR SERVICE BOX - SIDE PROFILE
SCALE: NTS



2 C–304 UTILIDOR SERVICE BOX - FRONT PROFILE
SCALE: NTS



3 C–304 UTILIDOR SERVICE BOX ISO
SCALE: NTS



4 C–304 HEAT TAPE LIGHTED END SEAL
SCALE: NTS

NOTES:

1. FABRICATE BOX FROM 1/8" 5052 H32 ALUMINUM.
2. ALL UTILIDOR SERVICE BOX JOINTS FORMED BY BENDING OR WELDED FULL LENGTH OF SEAM.
3. USE 5/16" x 1" SELF-TAPPING GALVANIZED SCREWS TO SECURE EXISTING UTILIDOR FLANGES AND UTILIDOR SERVICE BOX TO UTILIDOR.
4. FILL UTILIDOR VOIDS WITH BAGGED INSULATION.

BILL OF MATERIALS	DESCRIPTION
PEX LINE SERVICE	1" PEX, NO JOINTS PERMITTED FROM MAIN TO ARCTIC BOX BUILDING CONNECTION
ARCTIC CARRIER PIPE	NOMINAL 6" x 12" PRE-INSULATED HDPE, GRAVITY SEWER PIPE
SERVICE SADDLE	ROMAC 306-H 6" MAIN x 1" TAP
BALL CORP STUD	FORD F1600-4-NL, OR EQUIVALENT
VACUUM SEWER SADDLE	ELECTROFUSION SADDLE 4" MAIN x 2" HDPE STUB OUT

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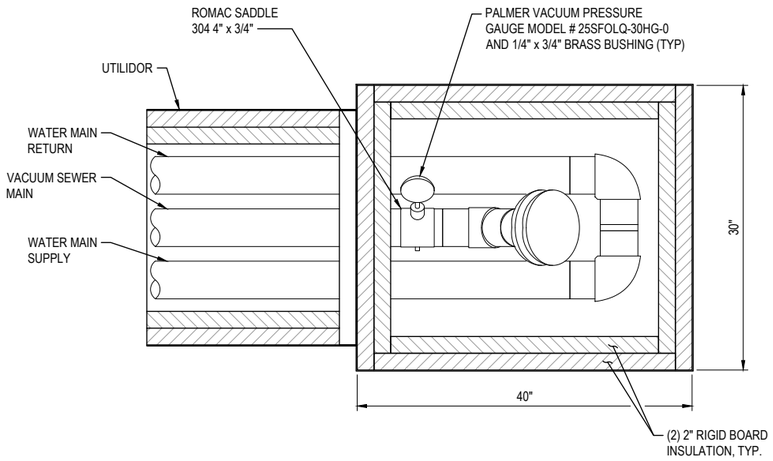
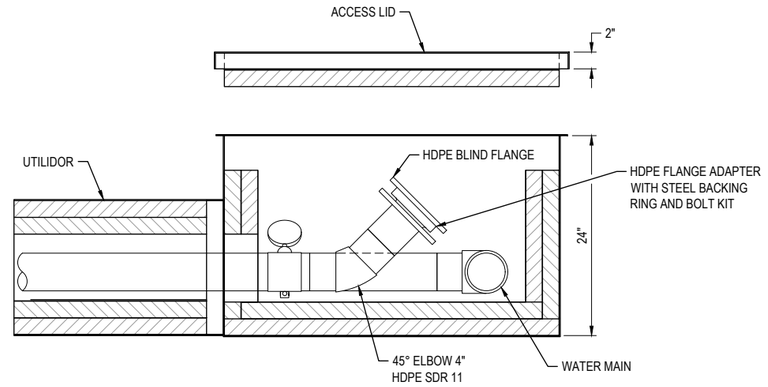
SHEET TITLE:
UTILIDOR CONNECTION DETAILS

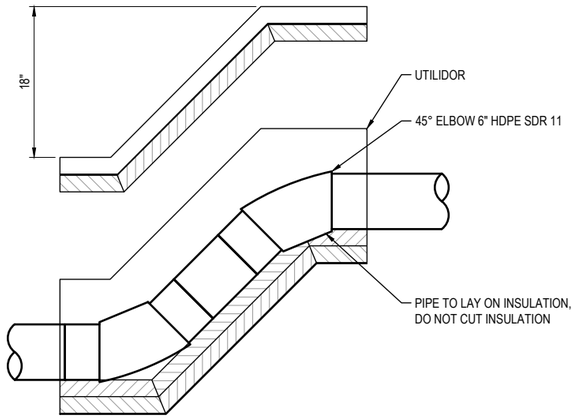
SHEET NO:
C-304



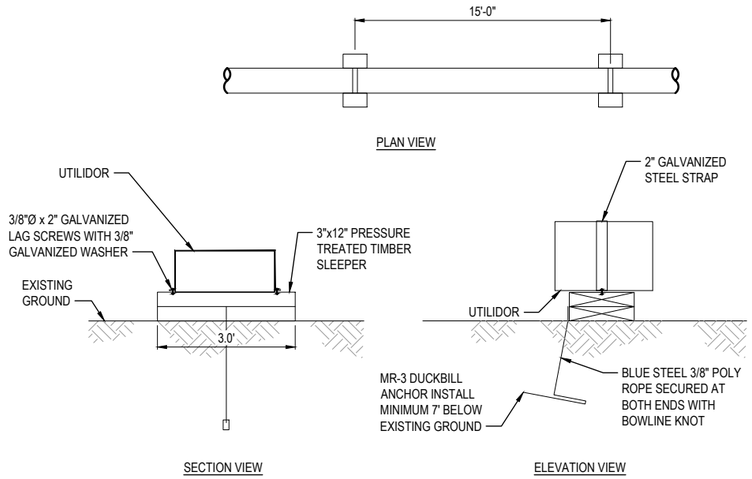
1 C–305 UTILIDOR TERMINUS - PLAN VIEW
SCALE: NTS



2 C–305 UTILIDOR TERMINUS - SECTION VIEW
SCALE: NTS



3 C–305 VACUUM SEWER MAIN LIFT
SCALE: NTS



4 C–305 UTILIDOR SUPPORT SPACING
SCALE: NTS

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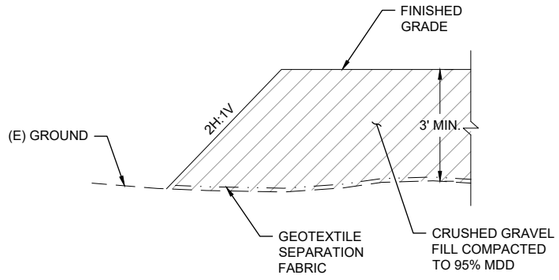
DATE	12/15/2023

SHEET TITLE:

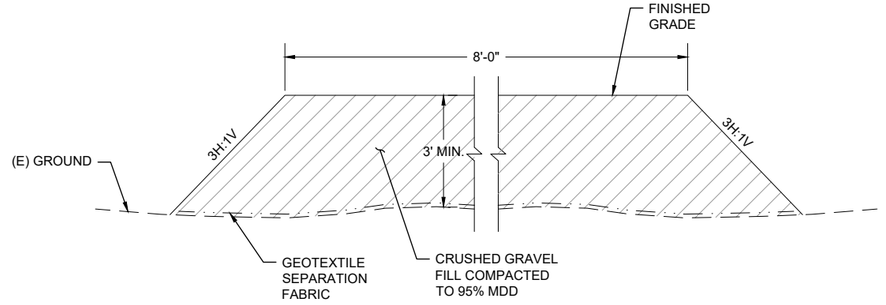
UTILIDOR
DETAILS

SHEET NO:

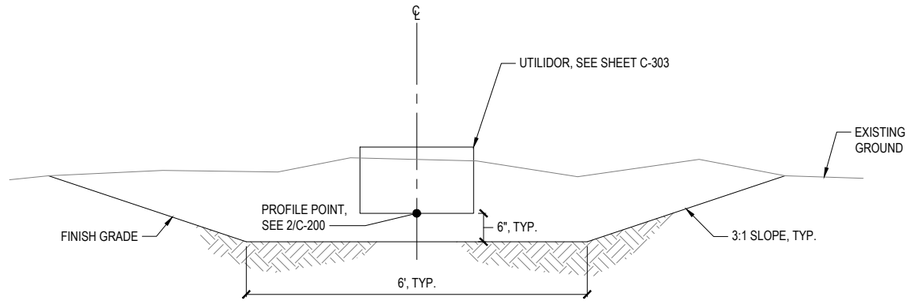
C-305



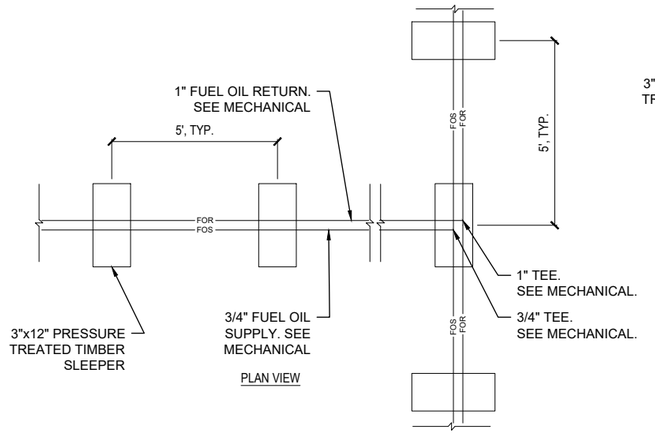
1 C–500 TYPICAL PAD SECTION
SCALE: NTS

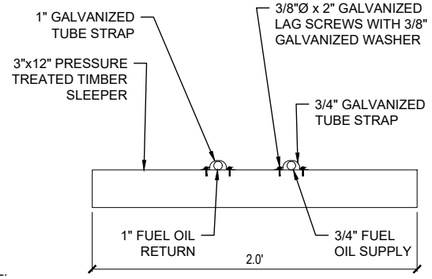


2 C–500 GRAVEL ROAD SECTION
SCALE: NTS

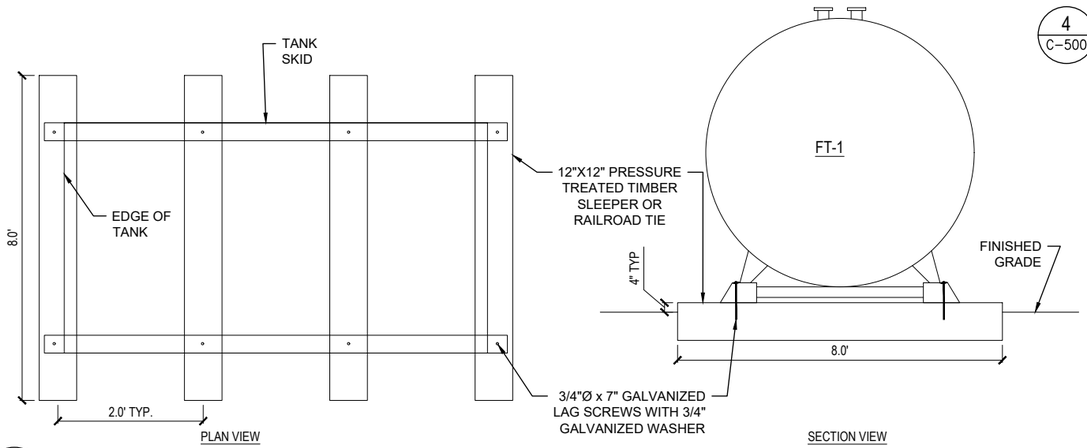


3 C–500 UTILIDOR GRADING SECTION
SCALE: NTS





4 C–500 FUEL PIPE SUPPORTS
SCALE: NTS



5 C–500 FUEL TANK FOUNDATION DETAIL
SCALE: NTS

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STATE OF ALASKA 49TH Michael S. Wilson Dec 15, 2023 No. CE11057 REGISTERED PROFESSIONAL ENGINEER

KAWERAK

KAWERAK, INC.

SAVOONGA REINDEER PROCESSING FACILITY

BID DOCUMENTS

REV	DATE	DESCRIPTION

PROJ. NO.	231585
DRAWN	DST
CHECKED	MAF
DATE	12/15/2023

SHEET TITLE:
CIVIL DETAILS

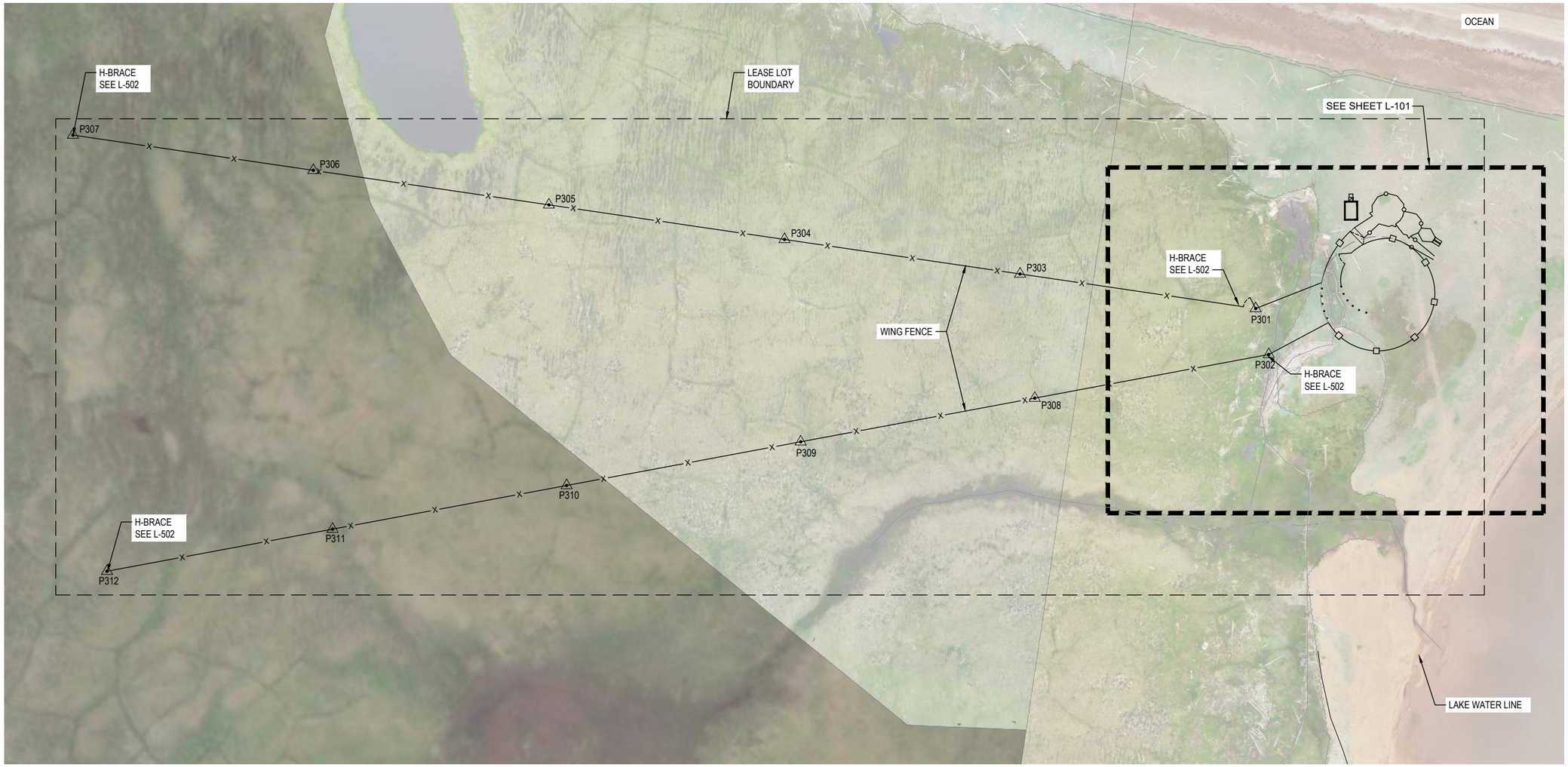
SHEET NO:
C-500

CONTROL POINT TABLE

POINT #	NORTHING	EASTING	DESCRIPTION
P301	3449141.09	1666002.42	FENCE
P302	3449092.87	1666016.23	FENCE
P303	3449177.36	1665755.06	FENCE
P304	3449213.63	1665507.71	FENCE
P305	3449249.90	1665260.35	FENCE
P306	3449286.18	1665013.00	FENCE
P307	3449323.18	1664760.64	FENCE
P308	3449047.02	1665770.47	FENCE
P309	3449001.16	1665524.71	FENCE
P310	3448955.30	1665278.95	FENCE
P311	3448909.44	1665033.19	FENCE
P312	3448865.25	1664796.38	FENCE

SHEET NOTES:

1. CONSTRUCTION ACTIVITIES SHALL OCCUR ON SAND, NOT TUNDRA.
2. THE CORRAL SUPPORT BUILDING IS UNOCCUPIED AND UNHEATED.
3. CONTRACTOR SHALL RESTORE ALL DISTURBED AREAS WITH SEED MIX TYPE A.
4. SEED MIX TYPE A SHALL BE: 50% NORTAN TUFTED HAIRGRASS, 25% BOREAL RED FESCUE, 20% GRUENING ALPINE BLUE, 5% ANNUAL RYE. APPLY AT 3 LBS PER 1,000 S.F.
5. PRIOR TO CONSTRUCTION, CONTRACTOR SHALL FIELD VERIFY ALL H-BRACE CONDITIONS. CONTRACTOR SHALL INSTALL ALL H-BRACING PER SHEET L-502



1 L-100 CORRAL SITE PLAN
SCALE: 1" = 60'-0"

NORTH

0 30 60 120 180
1"=60'-0"

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STATE OF ALASKA
EDWARD R. LEONETTI
Dec 15, 2023
No. 11158
REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT

KAWERAK

KAWERAK, INC.

SAVOONGA REINDEER PROCESSING FACILITY

BID DOCUMENTS

REV	DATE	DESCRIPTION

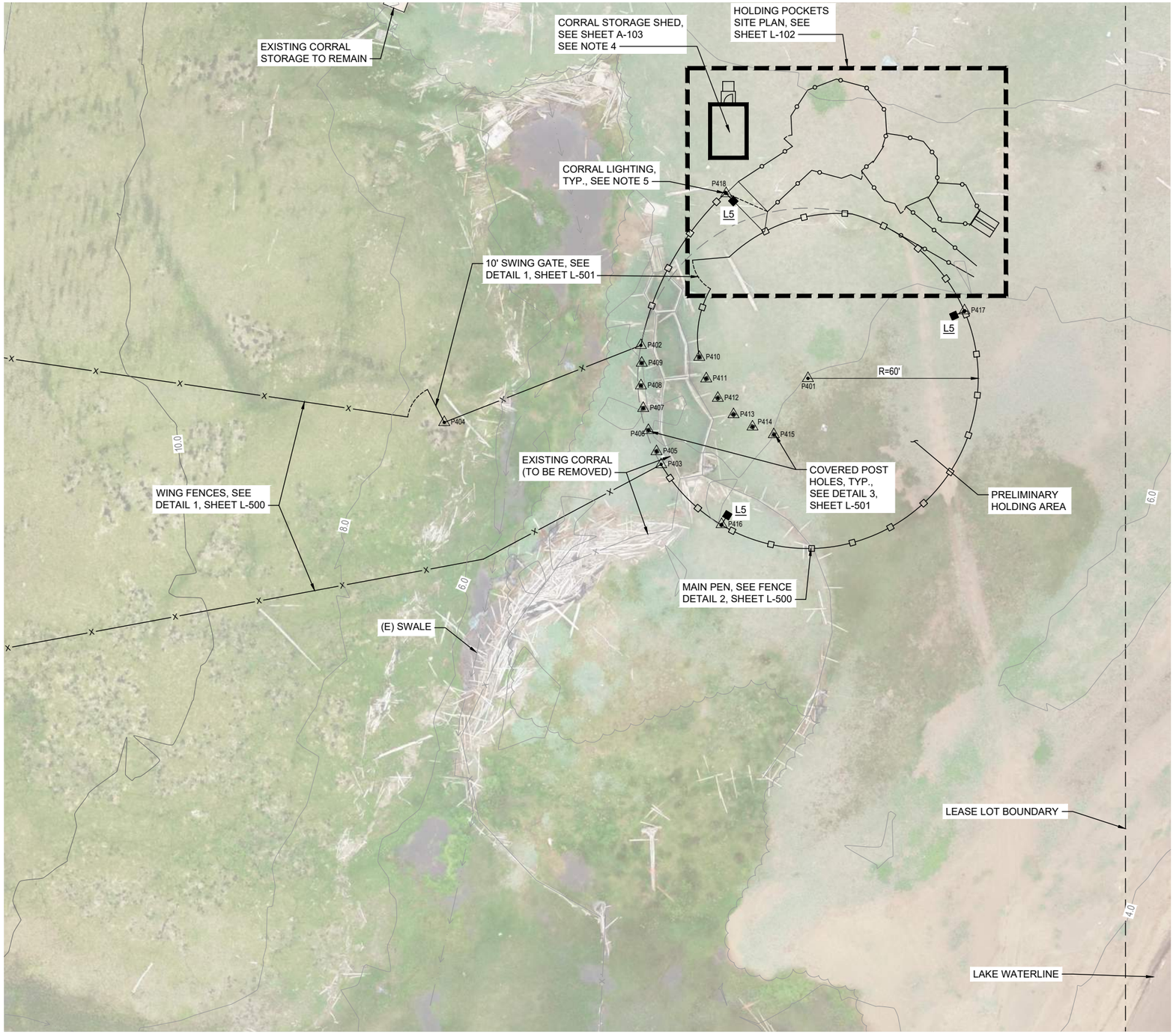
PROJ. NO.	231585
DRAWN	AJW / JLD
CHECKED	ERL
DATE	12/15/2023

SHEET TITLE:

CORRAL SITE PLAN

SHEET NO:

L-100



SHEET NOTES:

1. CONSTRUCTION ACTIVITIES SHALL OCCUR ON SAND, NOT TUNDRA.
2. THE CORRAL SUPPORT BUILDING IS UNOCCUPIED AND UNHEATED.
3. EXISTING CORRAL AND CORRAL DEBRIS TO BE REMOVED AND STOCKPILED IN A LOCATION OF OWNER'S CHOOSING ON SITE.
4. THE CORRAL SUPPORT BUILDING SHALL HOUSE (1) 120/240V, 1 PHASE, 3-WIRE PANELBOARD WITH GENERATOR INLET PLUG TO SUPPORT MAIN PEN CORRAL SITE LIGHTING. REFER TO ELECTRICAL FOR ADDITIONAL INFORMATION.
5. COBRA HEAD STYLE LED AREA LUMINAIRES MOUNTED TO WOOD POLES AT 20' AFG. CRUEXSP SERIES WITH MOUNTING ARM FOR WOOD POLE. REFER TO ELECTRICAL LIGHT FIXTURE SCHEDULE FOR MORE INFORMATION.
6. WOOD POLES FOR CORRAL LIGHTING SHALL BE 30' POLES WITH 10' DEPTH OF BURY.
7. CONTRACTOR SHALL RESTORE ALL DISTURBED AREAS WITH SEED MIX TYPE A. SEE SHEET C-101 NOTE 3

CONTROL POINT TABLE

POINT #	NORTHING	EASTING	DESCRIPTION
P401	3449156.60	1666130.59	CENTER OF CORRAL
P402	3449168.24	1666071.73	FENCE
P403	3449126.23	1666078.85	FENCE
P404	3449141.09	1666002.42	GATE
P405	3449130.81	1666077.22	POST
P406	3449138.28	1666074.36	POST
P407	3449146.06	1666072.53	POST
P408	3449154.01	1666071.74	POST
P409	3449162.00	1666072.02	POST
P410	3449164.07	1666092.30	POST
P411	3449156.48	1666094.74	POST
P412	3449149.62	1666098.82	POST
P413	3449143.86	1666104.36	POST
P414	3449139.51	1666111.05	POST
P415	3449136.79	1666118.55	POST
P416	3449105.09	1666100.15	LIGHT POST
P417	3449180.46	1666185.75	LIGHT POST
P418	3449221.76	1666101.78	LIGHT POST

1 L-101 ENLARGED CORRAL SITE PLAN
SCALE: 1" = 20'-0"

NORTH

1"=20'-0" 0 10 20 40 60

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KAWERAK

KAWERAK, INC.

SAVOONGA REINDEER PROCESSING FACILITY

BID DOCUMENTS

REV	DATE	DESCRIPTION

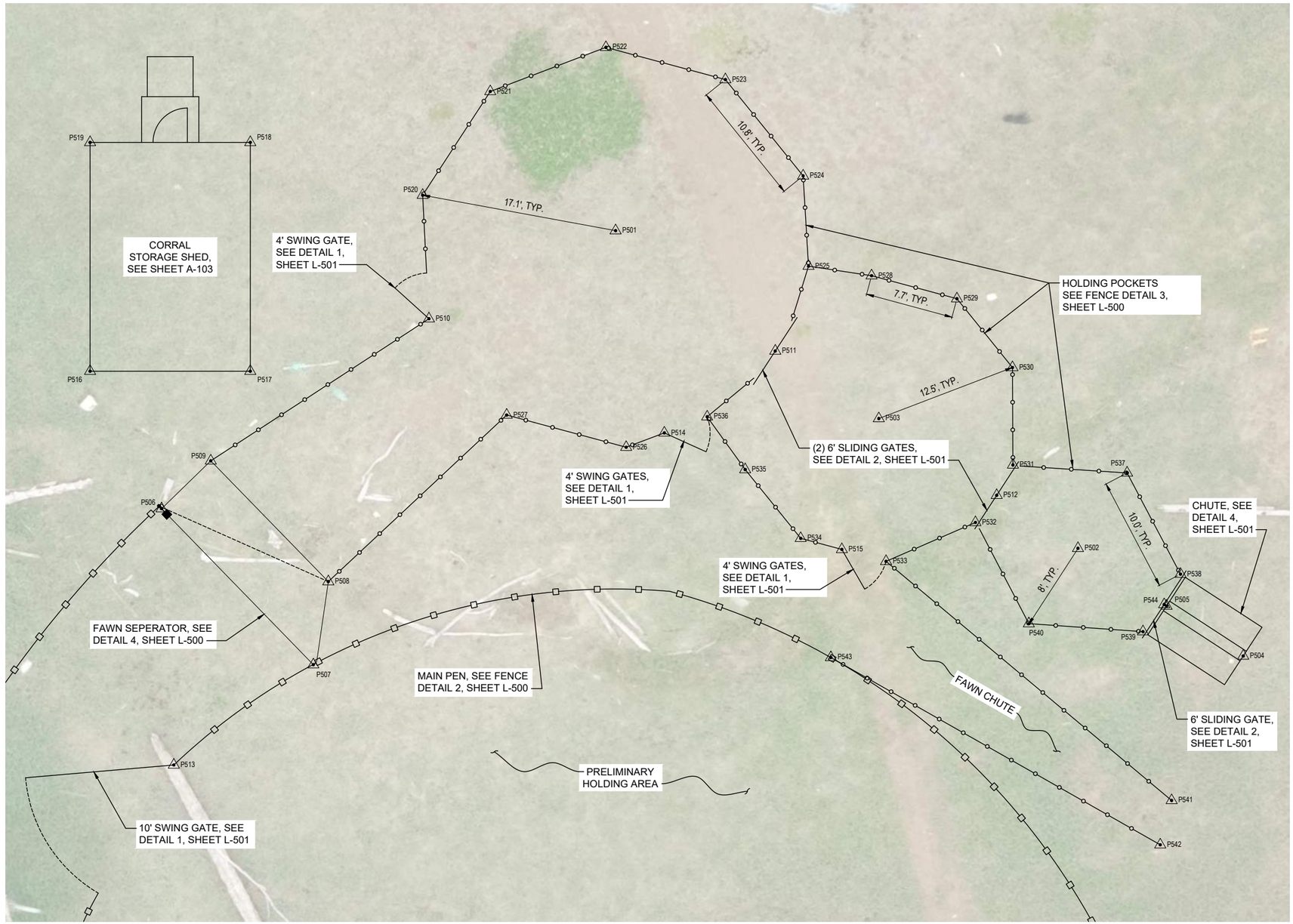
PROJ. NO.	231585
DRAWN	AJW / JLD
CHECKED	ERL
DATE	12/15/2023

SHEET TITLE:

ENLARGED CORRAL SITE PLAN

SHEET NO:

L-101



CONTROL POINT TABLE

POINT #	NORTHING	EASTING	DESCRIPTION
P501	3449246.07	1666141.45	CENTER OF HOLDING POCKET
P502	3449218.30	1666181.85	CENTER OF HOLDING POCKET
P503	3449229.64	1666164.45	CENTER OF HOLDING POCKET
P504	3449208.89	1666196.29	CHUTE
P505	3449213.26	1666189.59	CHUTE
P506	3449221.76	1666101.78	FAWN SEPARATOR/LIGHT POLE
P507	3449208.13	1666115.04	FAWN SEPARATOR
P508	3449215.39	1666116.35	FAWN SEPARATOR
P509	3449225.95	1666106.08	FAWN SEPARATOR
P510	3449238.37	1666125.14	GATE
P511	3449235.55	1666155.40	GATE
P512	3449222.93	1666174.75	GATE
P513	3449199.36	1666102.85	GATE
P514	3449228.39	1666145.71	GATE
P515	3449218.20	1666161.22	GATE
P516	3449233.78	1666095.53	STORAGE SHED
P517	3449233.78	1666109.53	STORAGE SHED
P518	3449253.78	1666109.53	STORAGE SHED
P519	3449253.78	1666095.53	STORAGE SHED
P520	3449249.17	1666124.59	HOLDING POCKET CORNER
P521	3449258.23	1666130.50	HOLDING POCKET CORNER
P522	3449262.09	1666140.60	HOLDING POCKET CORNER
P523	3449259.27	1666151.04	HOLDING POCKET CORNER
P524	3449250.86	1666157.84	HOLDING POCKET CORNER
P525	3449242.96	1666158.31	HOLDING POCKET CORNER
P526	3449227.13	1666142.37	HOLDING POCKET CORNER
P527	3449229.95	1666131.93	HOLDING POCKET CORNER
P528	3449242.13	1666163.82	HOLDING POCKET CORNER
P529	3449240.12	1666171.28	HOLDING POCKET CORNER
P530	3449234.10	1666176.13	HOLDING POCKET CORNER
P531	3449225.59	1666176.17	HOLDING POCKET CORNER
P532	3449220.56	1666172.89	HOLDING POCKET CORNER
P533	3449217.16	1666165.08	HOLDING POCKET CORNER / FAWN CHUTE
P534	3449219.17	1666157.62	HOLDING POCKET CORNER
P535	3449225.18	1666152.77	HOLDING POCKET CORNER
P536	3449229.80	1666149.45	HOLDING POCKET CORNER
P537	3449224.89	1666186.14	HOLDING POCKET CORNER
P538	3449216.04	1666190.81	HOLDING POCKET CORNER
P539	3449211.02	1666187.53	HOLDING POCKET CORNER
P540	3449211.72	1666177.56	HOLDING POCKET CORNER
P541	3449196.26	1666190.04	FAWN CHUTE
P542	3449192.39	1666189.04	FAWN CHUTE
P543	3449208.76	1666160.26	FAWN CHUTE
P544	3449213.39	1666189.39	GATE

1 L-102 ENLARGED HOLDING POCKETS SITE PLAN

SCALE: 1" = 5'-0"

NORTH

1"=5'-0" 0 5 10 15

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STATE OF ALASKA
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No. 11158
REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT

KAWERAK

KAWERAK, INC.

SAVOONGA REINDEER PROCESSING FACILITY

BID DOCUMENTS

REV	DATE	DESCRIPTION

PROJ. NO.	231585
DRAWN	AJW / JLD
CHECKED	ERL
DATE	12/15/2023

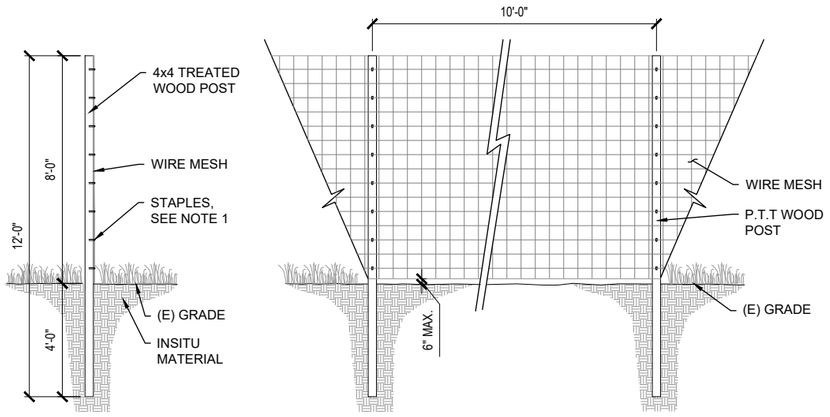
SHEET TITLE:

ENLARGED HOLDING POCKETS SITE PLAN

SHEET NO:

L-102

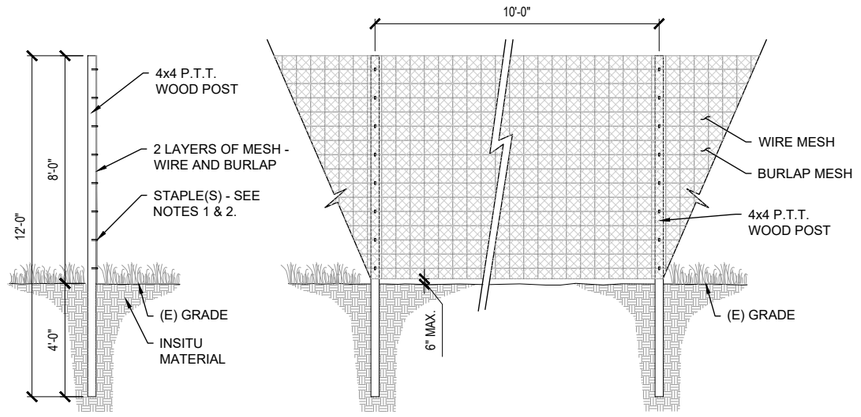
NOTES:
1. ALL WOOD SHALL BE PRESSURE TREATED TIMBER / 0.60 PCF
2. ATTACH WIRE MESH TO POST WITH (8) 1 ¼" GALVANIZED STAPLE, SPACED 12" MAX O.C.



1 WING FENCE
L-500 SCALE: 3/8" = 1'-0"

3/8"=1'-0" 0 1 2 3 4 6 8

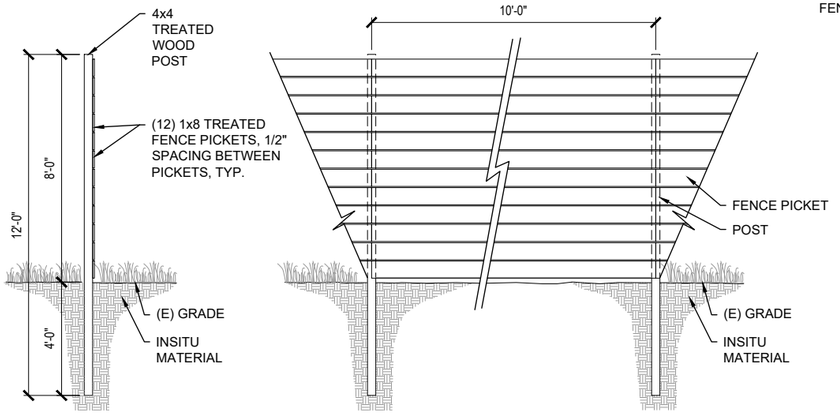
NOTES:
1. ATTACH WIRE MESH TO POST WITH (8) 1 ¼" GALVANIZED STAPLE, SPACED 12" MAX O.C.
2. ATTACH BURLAP MESH TO POST WITH (8) 1 ¼" GALVANIZED STAPLE, SPACED 12" MAX O.C.



2 CORRAL FENCE
L-500 SCALE: 3/8" = 1'-0"

3/8"=1'-0" 0 1 2 3 4 6 8

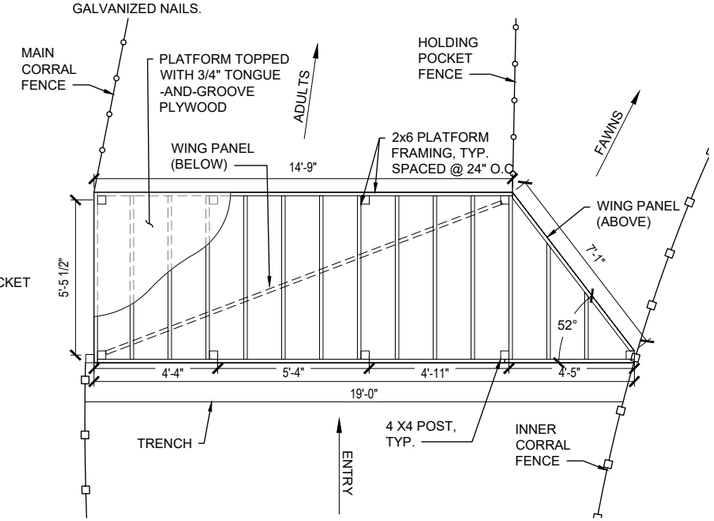
NOTES:
1. ATTACH FENCE PICKETS TO POST WITH (2) 8D NAILS AT EACH POST



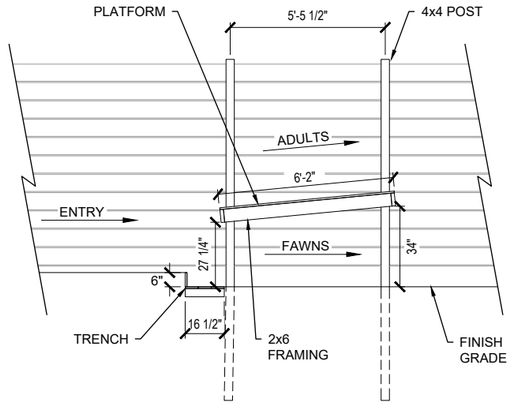
3 HOLDING POCKET FENCE
L-500 SCALE: 3/8" = 1'-0"

3/8"=1'-0" 0 1 2 3 4 6 8

NOTES:
1. ATTACH PLYWOOD TO PLATFORM FRAMING WITH 12D GALVANIZED NAILS. SPACE NAILS 12" O.C. MAX.
2. ATTACH PLATFORM FRAMING TO POSTS WITH (2) 16 PENNY NAILS PER BOARD.
3. ATTACH 2X6 OUTER FRAMING TO JOISTS WITH 12D GALVANIZED NAILS.



PLAN VIEW



PROFILE VIEW

4 FAWN SEPERATOR
L-500 SCALE: 1/2" = 1'-0"

1/2"=1'-0" 0 1 2 4 6

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KAWERAK

KAWERAK, INC.

SAVOONGA REINDEER PROCESSING FACILITY

BID DOCUMENTS

REV	DATE	DESCRIPTION

PROJ. NO.	231585
DRAWN	AJW
CHECKED	ERL
DATE	12/15/2023

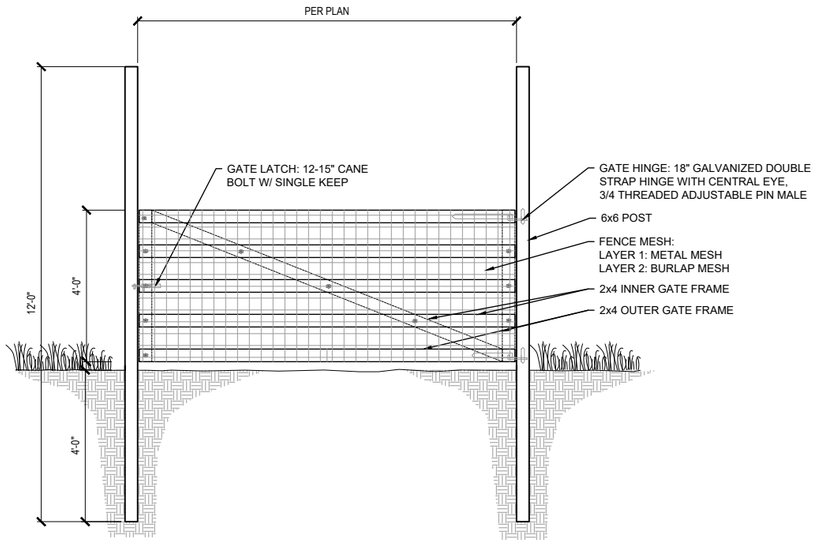
SHEET TITLE:

CORRAL DETAILS

SHEET NO:

L-500

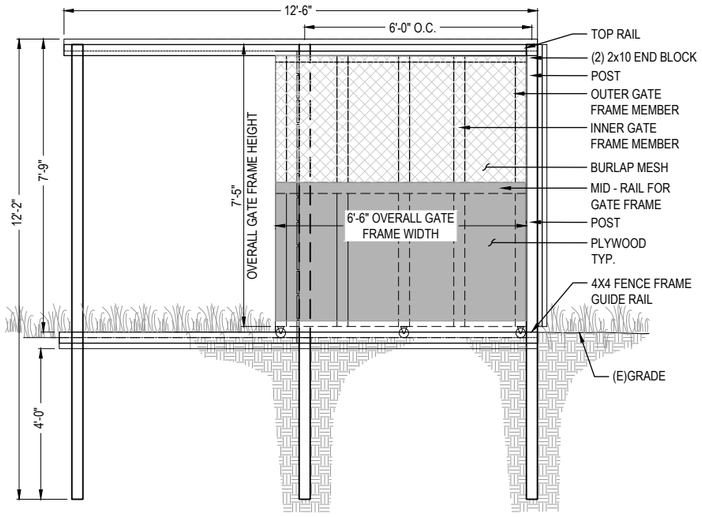
NOTES:
1. ALL WOOD SHALL BE PRESSURE TREATED TIMBER (P.T.T) / 0.60 PCF
2. CONNECT OUTER GATE FRAME TO INNER GATE FRAME WITH ½ X 3 GALVANIZED LAG SCREWS PER CONNECTION
3. ATTACH BURLAP MESH TO GATE FRAME WITH 1 ¼" GALVANIZED STAPLE, SPACE 12" O.C. .MAX.
4. ATTACHED METAL MESH TO GATE FRAME WITH 1 ¼" GALVANIZED STAPLE, SAPCE 12" O.C. MAX.



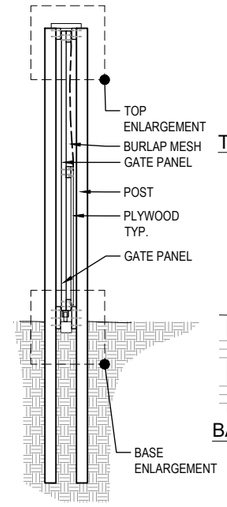
1 L-501 **SWING GATE**
SCALE: 1/2" = 1'-0"

1/2"=1'-0" 0 1 2 4 6

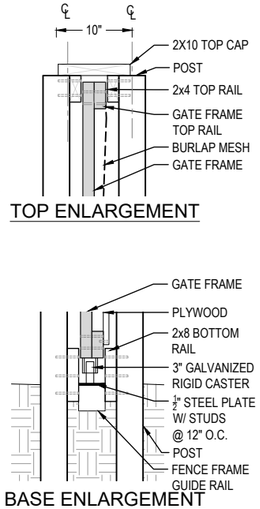
NOTES:
1. ALL WOOD SHALL BE PRESSURE TREATED TIMBER (P.T.T) / 0.60 PCF
2. ATTACH PLYWOOD TO GATE FRAME WITH 8D GALVANIZED NAILS. SPACE NAILS 12" O.C. MAX.
3. ATTACH 2X4 TO 4X4 WITH (2)12D GALVANIZED NAILS.
4. ATTACH 4x4 WITH 50D GALVANIZED NAILS.
5. ATTACH BURLAP MESH TO OUTER AND INNER GATE FRAME MEMBER WITH 1 ¼" GALVANIZED STAPLE, SPACE 12" O.C. .MAX.
6. GATE FRAME TOP, BOTTOM AND MID RAILS SHALL BE CONSTRUCTED OUT OF 2X4 P.T.T.
7. PLYWOOD SHALL BE ¾" PRESSURE TREATED WOOD / 0.60 PCF
8. ATTACH END BLOCK TO POST WITH (2) ¼" x 3" GALVANIZED LAG SCREWS



ELEVATION



SECTION



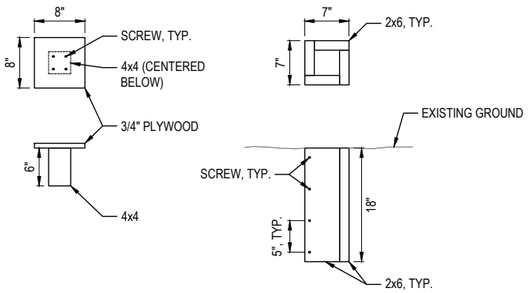
2 L-501 **SLIDING GATE**
SCALE: NTS

1/2"=1'-0" 0 1 2 4 6

1/2"=1'-0" 0 1 2 4 6

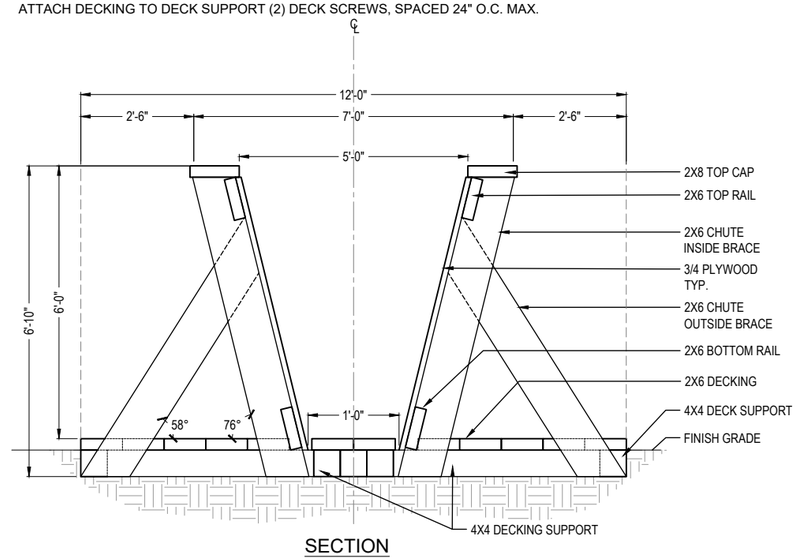
NOTES:
1. ALL WOOD SHALL BE PRESSURE TREATED TIMBER / 0.60 PCF
2. ATTACH PLYWOOD TO 2X6 FRAME WITH 12D GALVANIZED NAILS. SPACE NAILS 12" O.C. MAX.
3. ATTACH 2X6 TO 4X4 WITH (2) 12D GALVANIZED NAILS PER CONNECTION.
4. ATTACH 4x4 TO 4X4 FRAME WITH (2) 50D GALVANIZED NAILS PER CONNECTION.
5. ATTACH DECKING TO DECK SUPPORT (2) DECK SCREWS, SPACED 24" O.C. MAX.

NOTES:
1. ALL WOOD SHALL BE PRESSURE TREATED TIMBER (P.T.T) / 0.60 PCF

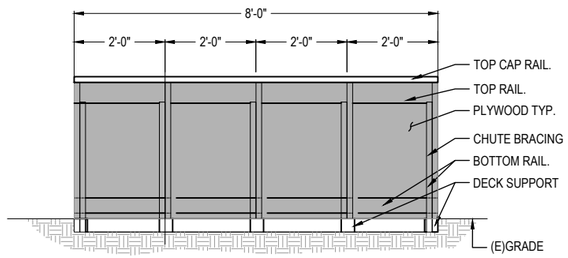


3 L-501 **COVERED POST HOLE**
SCALE: 1" = 1'-0"

1"=1'-0" 0 1 2 3



SECTION



ELEVATION

4 L-501 **V-SHAPED CHUTE**
SCALE: AS SHOWN

1"=10'-0" 0 5 10 20 30

1"=20'-0" 0 10 20 40 60

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KAWERAK

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SAVOONGA REINDEER PROCESSING FACILITY

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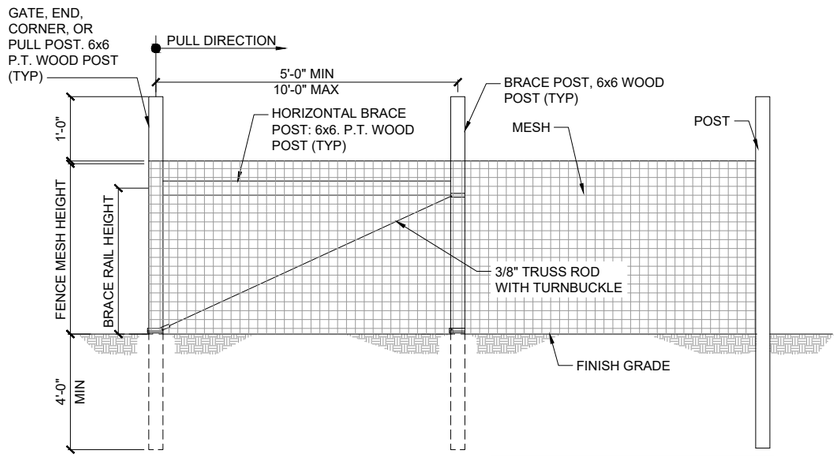
CHECKED	ERL
DATE	12/15/2023

SHEET TITLE:
CORRAL DETAILS

SHEET NO:
L-501

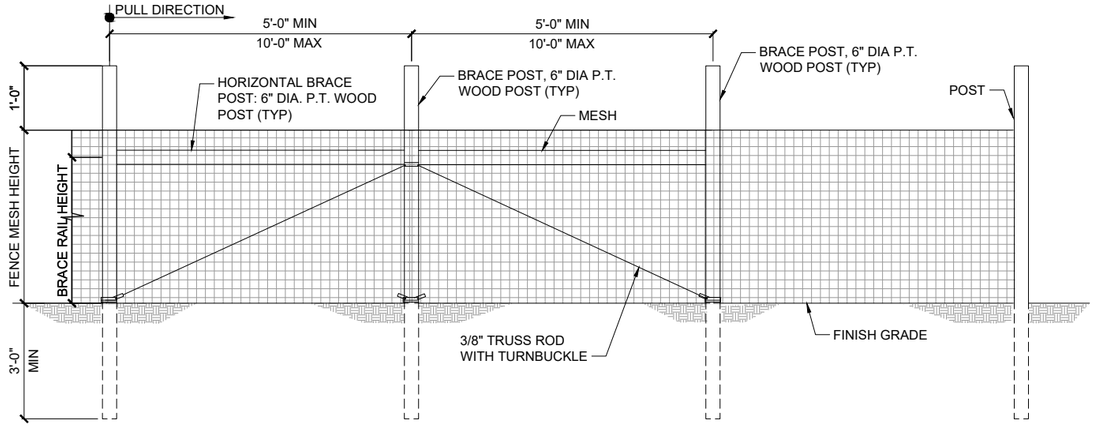
NOTES:
1. ALL WOOD SHALL BE PRESSURE TREATED TIMBER (P.T.T) / 0.60 PCF
2. ATTACH POST TO HORIZONTAL BRACING WITH SIMPSON STRONG TIE, STRONG DRIVE SDWH TIMBER HEX SCREW 0.275x10" WITH DOUBLE-BARRIER COATING (4) PER CONNECTION



FENCE MESH HEIGHT	POST HEIGHT	BRACE RAIL HEIGHT
8'-0"	10'-6"	4'-6"

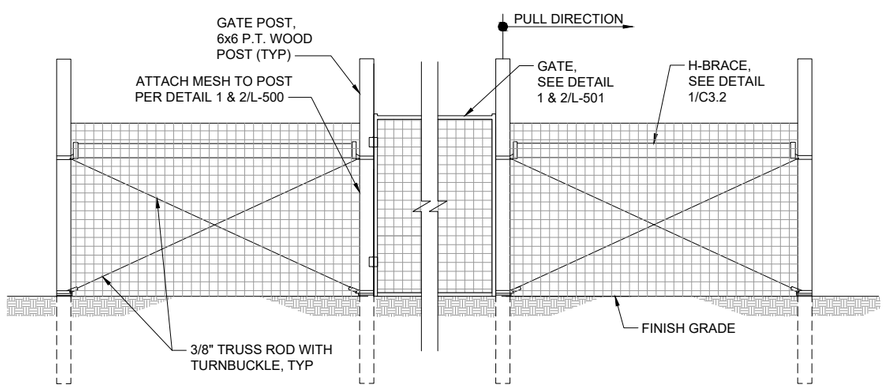
1 L-502 SINGLE H-BRACE
SCALE: N.T.S.

NOTES:
1. ALL WOOD SHALL BE PRESSURE TREATED TIMBER (P.T.T) / 0.60 PCF
2. ATTACH POST TO HORIZONTAL BRACING WITH SIMPSON STRONG TIE, STRONG DRIVE SDWH TIMBER HEX SCREW 0.275x10" WITH DOUBLE-BARRIER COATING (4) PER CONNECTION



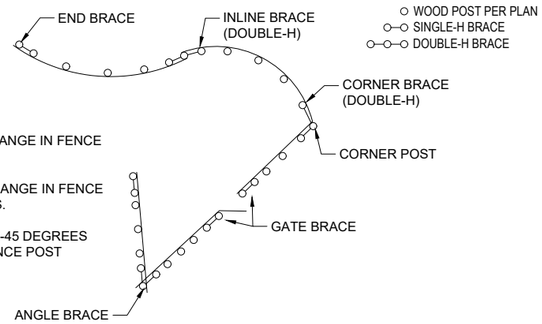
FENCE MESH HEIGHT	POST HEIGHT	BRACE RAIL HEIGHT
8'-0"	10'-6"	4'-6"

2 L-502 DOUBLE H-BRACE
SCALE: N.T.S.



3 L-502 H-BRACE AT GATE
SCALE: N.T.S.

NOTES:
1. PROVIDE H-BRACING THROUGHOUT PROJECT AT THE BEGINNING AND ENDS OF ALL FENCE SECTIONS, HARD AND SOFT CORNERS TO MAINTAIN FENCE INTEGRITY.
2. SOFT CORNER IS DEFINED AS ANY CHANGE IN FENCE ALIGNMENT BETWEEN 0-45 DEGREES.
3. HARD CORNER IS DEFINED AS ANY CHANGE IN FENCE ALIGNMENT BETWEEN 45-90 DEGREES.
4. A CHANGE IN DIRECTION BETWEEN 30-45 DEGREES CAN USE A MAXY POST IN LIEU OF FENCE POST



4 L-502 FENCE BRACE PLACEMENT DIAGRAM
SCALE: N.T.S.

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STATE OF ALASKA — EDWARD R. LEONETTI — Dec 15, 2023 — No. 11158 — REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT

KAWERAK

KAWERAK, INC.

SAVOONGA REINDEER PROCESSING FACILITY

BID DOCUMENTS

REV	DATE	DESCRIPTION

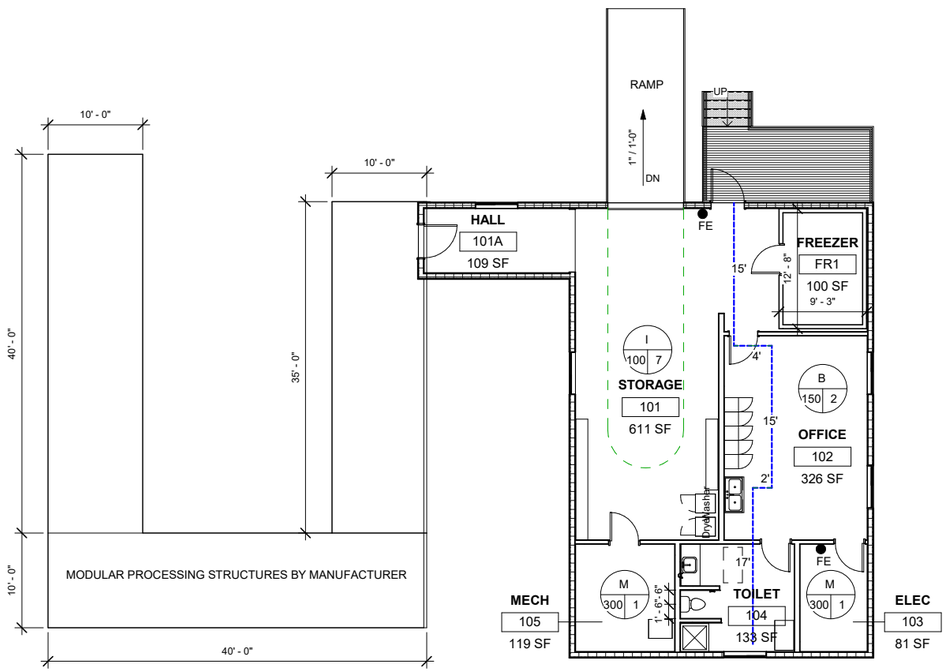
PROJ. NO.	231585
DRAWN	AJW / JLD
CHECKED	ERL
DATE	12/15/2023

SHEET TITLE:

H-BRACE DETAILS

SHEET NO:

L-502



NORTH

1 A-001 LIFE SAFETY PLAN - SUPPORT BUILDING

1/8" = 1'-0"

Savoonga Reindeer Plant Code Analysis – Code Summary

International Building Code 2021 as amended by SOA

New construction of a 1 story building containing storage (including a small vehicle) and office with support spaces.

Construction Type: Type V-B

Occupancy Groups: (Type S-1 used for allowable height and area)
- Group S: IBC 311.3 allows this classification for a storage building with low-hazard storage goods. In this case it would include an enclosed parking garage for an ATV vehicle.

Incidental Use Areas (TA.509):
- Boiler room requires 1-hr if boiler is >15psi and 10hp

Buildings on same lot (503.1.2)
- Both the modular and storage building are 1 story and so do not exceed building height limit. Allowable building area does not exceed 9000sf.

Separation of Occupancies (Table 508.4):
- None required

Allowable Height & Area (Table 504.3)
- 2 stories
- 40' maximum height
- Actual story height is 1 and < 40' = OK
- Allowable Area for S-1 or B Occupancy = 9000sf
- Actual Area = 1792sf and < 9000sf = OK

Structural Fire Resistance (Table 601):
No fire resistance of structural elements required for Type V-B construction

Exterior Wall and Openings
- Fire Rating of Exterior Walls (TA705.5) No rating required for exterior walls between S-1/B and adjacent F-1 Occupancy if Fire Separation distance is >10'.
- Maximum area of exterior wall openings (TA 705.8) with fire separation distance 10-15ft = 15% for unprotected, unsprinklered openings. Proposed openings in wall adjacent to F-1 occupancy = 8% of wall area.

Fire Protection:
- No fire protection measures are required for this building according to it's occupancy group S-1/B.

Interior Finishes (Table 803.9)
- Exit stairways, ramps and exist passageways = Class B
- Exit access corridors finishes = Class B
- Room finishes = Class C

Occupant Loads and Exiting:
- Occupant loads (**Table 1004.5**)
- (I) Industrial Areas = 100 gross
- (B) Business Area = 150 gross
- (M) Mechanical Room = 300 gross
- Egress component widths = .2in per occupant without sprinklers except stairways at .3in per occupant. (1005.3)
- Common path of egress travel distance not to exceed 75' (Table 1006.2.1)
- Exit access travel distance not to exceed 300' (Table 1017.2)
- One exit required from boiler room with <400k BTU fuel-fired equipment (IFC 1006.2.2.1)

Accessibility
- IBC Chapter 11 and ANSI A117.1-2009 are used as a design metric for building accessibility requirements.
- Means of egress stairway width is calculated by a means of egress capacity factor of 0.3 inch per occupant: 0.3 inch * 250 occupant load = 75 inchs width = 6 foot and 3 inches wide. (1005.3.1)
- Vehicular ramps shall not be considered as an exit access ramp unless pedestrian facilities are provided (IFC 1006.2.2.5). **Public Parking Garages: Open vehicular ramps that are used for vertical circulation as well as for parking shall not a slope of 1 unit vertical in 15 units horizontal (406.4.3) **Open Parking Garages: Ramp access height for IV construction is 4 tiers.
- **This facility is not accessible to the public. All employees of the meat processing and storage facility are assumed to be able-bodied. No ramps for accessible entrances are provided in the design.**
- In accordance with the Americans with Disabilities Act of 1990 (ADA) (42 U.S.C. 12101 et seq.), the Architectural Barriers Act of 1968 (42 U.S.C. 4151 et seq.) and the Accessibility Guidelines for Buildings and Facilities regulations, as amended (36 C.F.R. part 1191), the project falls under except 5.(A)&B because the employer will have fewer than 20 people employed and working at the facility. 1

Portable Fire Extinguishers:
- Portable fire extinguishers provided at exits and in mechanical room (906.1)

Required Plumbing Fixtures:
- (IBC Table 2902.1) 1 water closet and 1 lavatory per 100 occupants in S occupancy. 1 drinking fountain per 1000 occupants and 1 service sink.

Floor surfaces:
- Motor-vehicle related occupancy floor surfaces shall be of concrete or similar approved noncombustible and nonabsorbent materials. The area of floor used for the parking of automobile or other vehicles shall be sloped to facilitate the movement of liquids to a drain or towards the main vehicle entry doorway. (Section 406.2.4)

Ventilation
- Enclosed parking garages shall provide mechanical ventilation system and exhaust system (406.6.2)
- Attic venting: Vent area min = 1/150 of area ventilated
  = 1800sf/150 = 12sf min ventilation
  = 2 (3") vent holes per truss bay
  = (2*0.05st holes) * 6 truss bays
  = 0.6sf * 2 sides
  = 1.2sf
  = 12sf min - 1.2sf = 10.8sf gable ends / 2
  = 5.4sf each gable end venting
  2' x 3' louvers on each gable end

◆ SUITE EXIT

■ FEC — FIRE EXTINGUISHER WALL CABINET; PROVIDE & INSTALL

● FE — WALL BRACKET MOUNT; PROVIDE & INSTALL

NOTE
1. COORDINATE LOCATION OF FIRE EXTINGUISHERS WITH EQUIPMENT AT MECHANICAL AND ELECTRICAL ROOMS.
2. PORTABLE FIRE EXTINGUISHER TYPE: MIN. 2A-10BC

1 HR RATED ASSEMBLY

X FT — COMMON PATH OF EGRESS

(P) EXIT — PANIC HARDWARE

DOOR EGRESS CAPACITY

XX — OCCUPANTS SERVED
32 XX — ACTUAL CAPACITY (INCHES)
*MIN REQUIRED CAPACITY (INCHES)

*MIN CLEAR OPENING WIDTH SHALL BE 32 INCHES

ROOM EGRESS CAPACITY

B — OCCUPANCY GROUP
100 XX — OCCUPANT LOAD
OCCUPANT LOAD FACTOR

STAIR EGRESS CAPACITY

XX — OCCUPANTS SERVED
44 XX — ACTUAL CAPACITY (INCHES)
**MIN REQUIRED CAPACITY (INCHES)

**MIN STAIR WIDTH SHALL BE NOT LESS THAN 44 INCHES

BUILDING AREAS	
Name	Area
PROCESSING BUILDING	1136 SF
STORAGE BUILDING	1680 SF
Grand total: 2	2816 SF

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STATE OF ALASKA — Garrett P. Burtner — No. 12683 — REGISTERED PROFESSIONAL ENGINEER
3/19/23

MCG EXPLORE DESIGN

KAWERAK, INC.

SAVOONGA REINDEER PROCESSING FACILITY

PERMIT DOCUMENTS

REV	DATE	DESCRIPTION

BID DOCUMENTS

PROJ. NO.	2023021.01
DRAWN	SP
CHECKED	GPB
DATE	3/19/23

SHEET TITLE:

CODE SUMMARY AND LIFE SAFETY PLAN

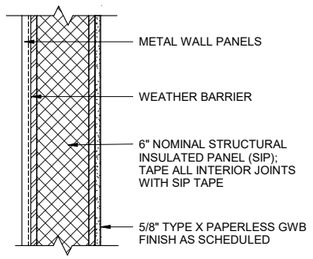
SHEET NO:

A-001

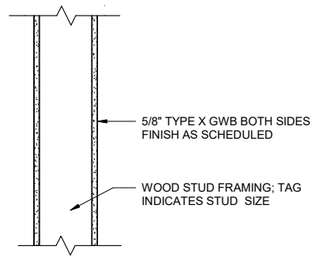
SHEET OF

3/19/2024 10:36:49 AM

VERTICAL ASSEMLBY TYPES



A EXTERIOR WALL



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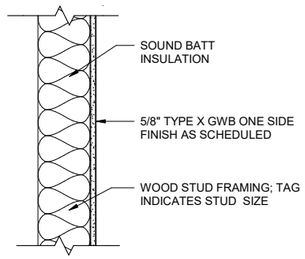
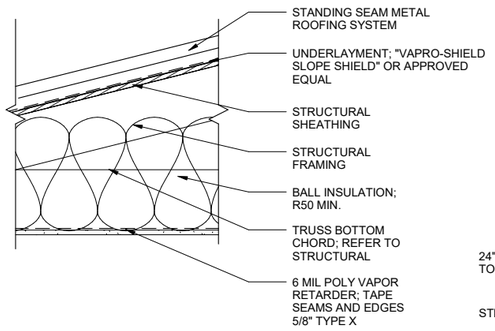
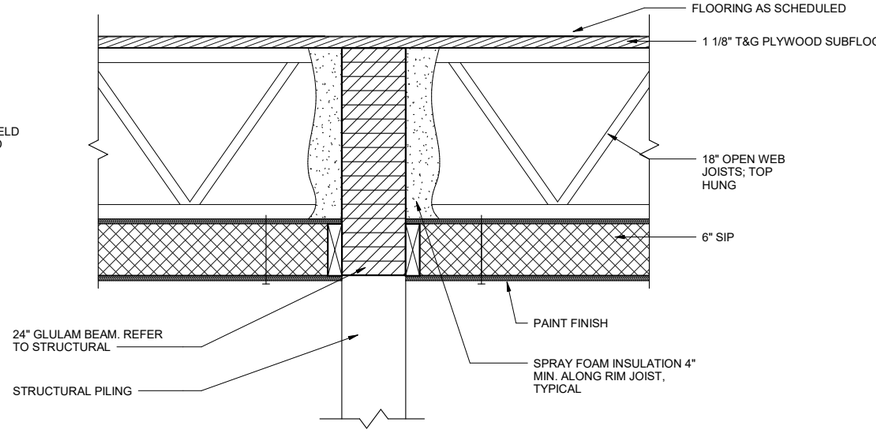


C INTERIOR PARTITION

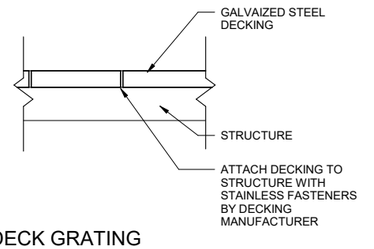
HORIZONTAL ASSEMBLIES TYPES



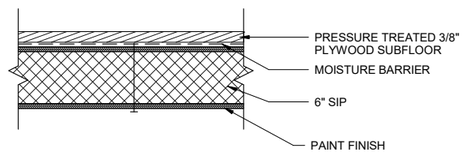
1 ROOF ASSEMBLY - SUPPORT BLDG.



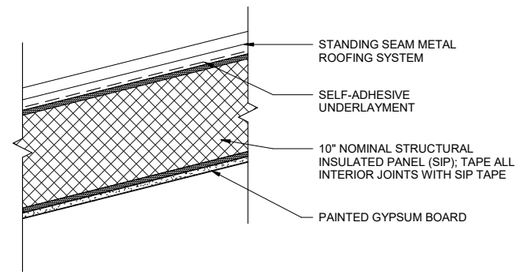
2 FLOOR ASSEMBLY



3 DECK GRATING



4 FLOOR ASSEMBLY



5 ROOF ASSEMBLY - SIP

LEGEND

WALL TAG SYMBOL:

WALL TAG LETTER INDICATES ASSEMBLY TYPE — A4 — NUMBER INDICATES STUD SIZE

	WOOD	METAL
	4 = 3 1/2"	4 = 4"
	6 = 5 1/2"	6 = 6"
	8 = 7 1/4"	

GENERAL NOTES

1) ALL WALL FRAMING AND GWB CONTINUE TO BOTTOM OF TRUSS ABOVE UNLESS OTHERWISE NOTED
2) ALL DIMENSIONS ARE TO FACE OF STUD OR CONCRETE UNLESS OTHERWISE NOTED. DIMENSIONING POINTS ARE TO THE MAIN WALL MEMBER AND NOT TO THE FACE OF ANY FURRING SHOWN ON THE WALL TYPES.
3) FINISH MATERIAL SUCH AS CERAMIC TILE, WALL COVERINGS, ETC. ARE NOT TYPICALLY SHOWN AS AN INTEGRAL PART OF THE ASSEMBLY. REFER TO FINISH SCHEDULES AND INTERIOR ELEVATIONS FOR ADDITIONAL FINISH REQUIREMENTS
4) PROVIDE FIRE RESISTANT RATED 5/8" CEMENT BOARD IN LIEU OF GYPSUM BOARD AS SUBSTRATE TO ALL WALLS WITH INTERIOR CERAMIC TILE FINISH; REFER TO FINISH SCHEDULE FOR LOCATIONS.
5) STUD SIZES TYPICALLY THROUGHOUT THE PROJECT ARE SHOWN WITH EACH ASSEMBLY TYPE.
6) REFER TO STRUCTURAL DRAWINGS FOR GAUGE AND SPACING OF STRUCTURAL STUDS

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STATE OF ALASKA — Garrett P. Burtner — No. 12683 — REGISTERED PROFESSIONAL ENGINEER
12/15/23

MCG EXPLORE DESIGN

KAWERAK, INC.

SAVOONGA REINDEER PROCESSING FACILITY

PERMIT DOCUMENTS

BID DOCUMENTS

REV	DATE	DESCRIPTION
-		

PROJ. NO.	2023021.01
DRAWN	SP
CHECKED	GPB
DATE	12/15/23

SHEET TITLE:
ASSEMBLY TYPES

SHEET NO:
A-002

SHEET OF

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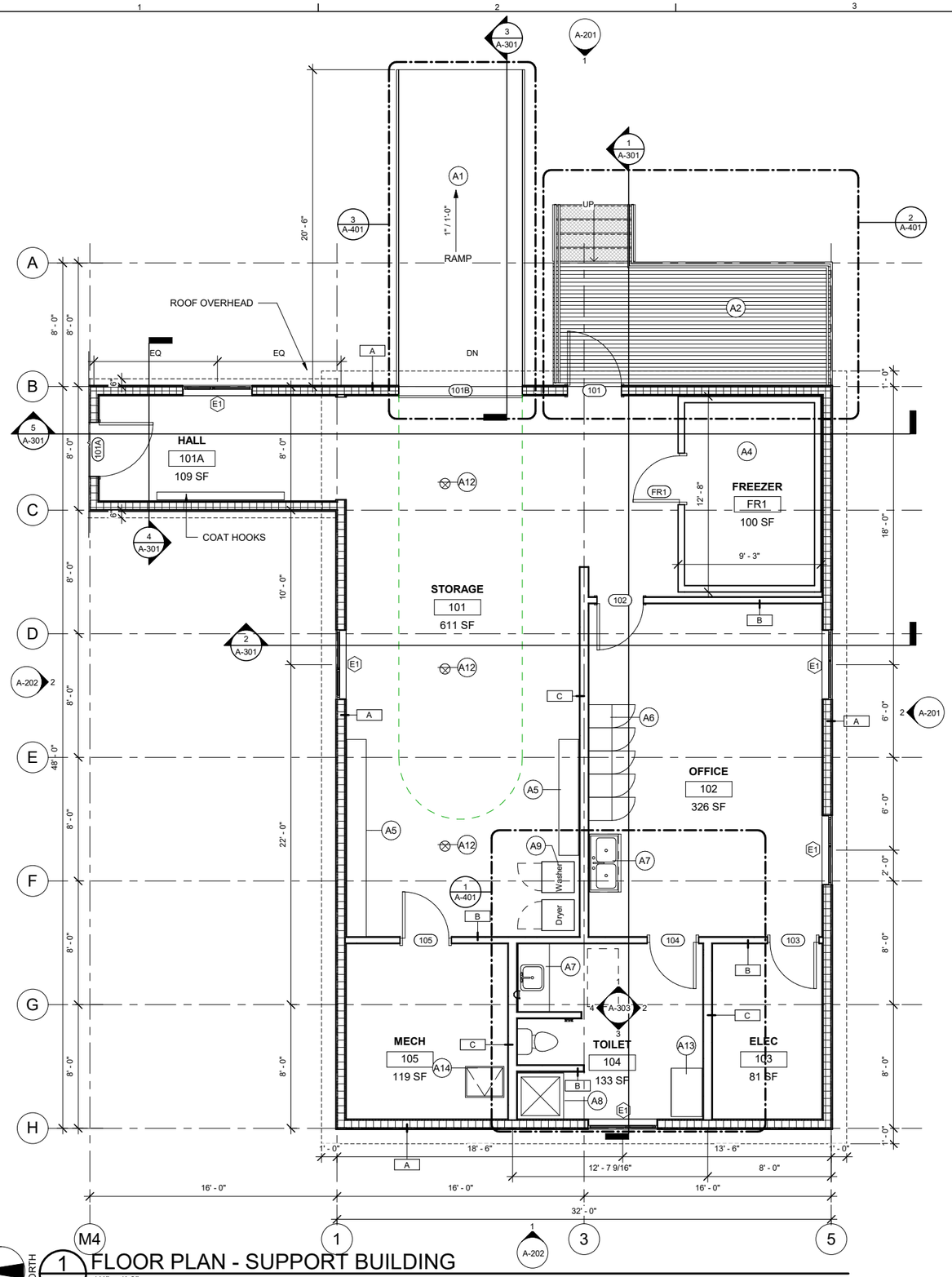

KEYNOTES

A1	RAMP; TREATED METAL FRAMING WITH GALVANIZED STEEL GRATING
A2	STAIR AND DECK; TREATED TIMBER FRAMING WITH GALVANIZED STEEL GRATING
A4	PACKAGED WALK-IN FREEZER UNIT; TRIM TO SURROUNDING CONSTRUCTION; REFER TO MECHANICAL
A5	HEAVY DUTY METAL SHELVING
A6	METAL LOCKERS; 1'6"W X 1'6"D X 6'H
A7	SOLID SURFACE COUNTERTOP WITH SINK & CASEWORK, SEE 1/A-503
A8	FIBERGLASS SHOWER INSERT
A9	WASHER OR DRYER UNIT
A12	FLOOR DRAIN; REFER TO MECHANICAL
A13	TALL CABINET, SEE 2/A-503
A14	ACCESS HATCH 24" X 30"; HINGED WITH EDGE TRIMS AND FLUSH PULL HARDWARE

FLOOR PLAN LEGEND

- A1 — SHEET NOTES
- E1 — WINDOW TAG
- A — WALL TAG
- 101 — DOOR TAG

NORTH

1 A-101 FLOOR PLAN - SUPPORT BUILDING

1/4" = 1'-0"

12/15/2023 4:06:50 PM

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PROJ. NO.	2023021.01
DRAWN	SP
CHECKED	GPB
DATE	12/15/23

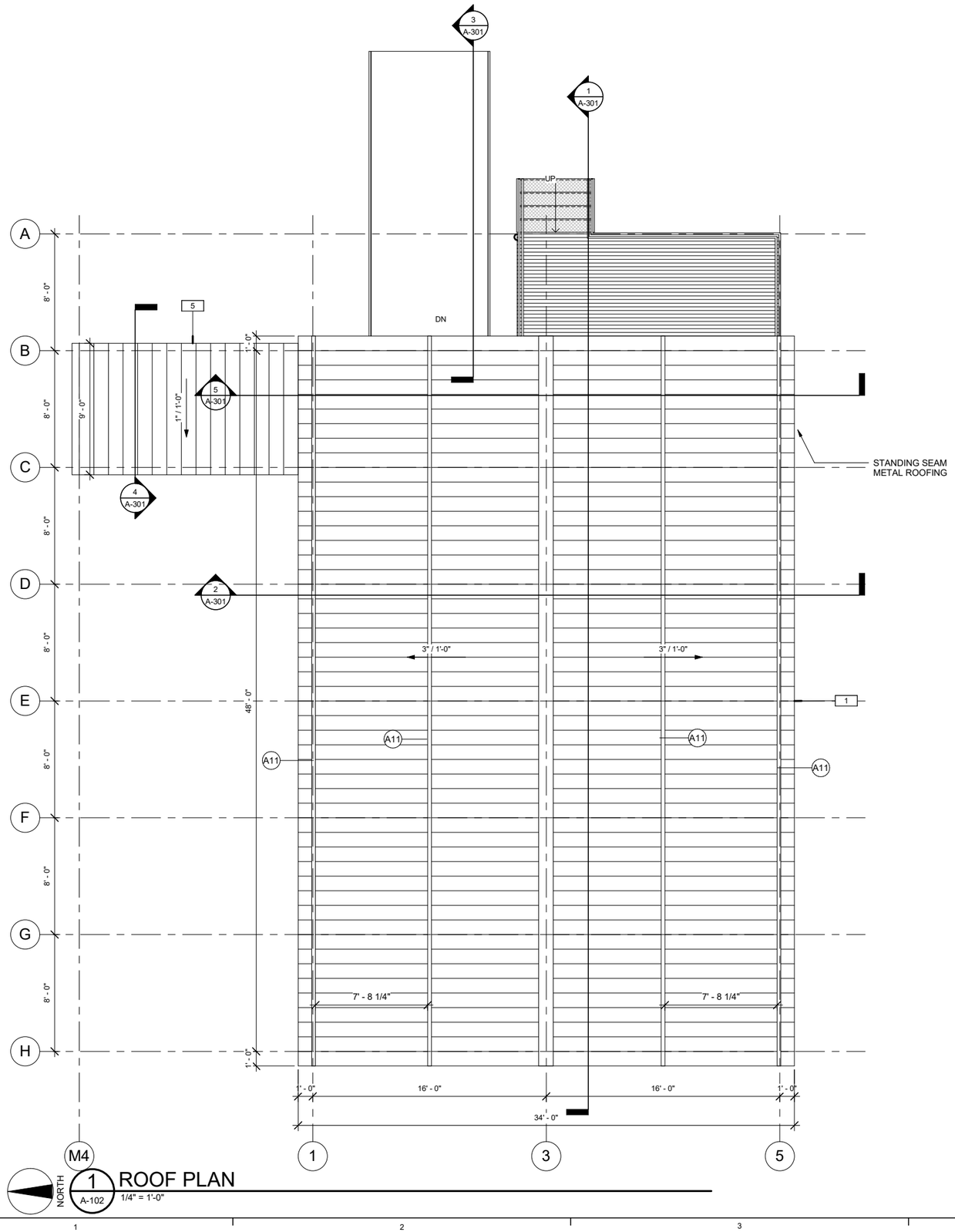
SHEET TITLE:

FLOOR PLAN - SUPPORT BLDG.

SHEET NO:

A-101

SHEET OF



NORTH

1 A-102 ROOF PLAN

1/4" = 1'-0"

KEYNOTES

A11 METAL ROOF SNOW GUARD SYSTEM; REFER TO SPEC SECTION 07 72 53

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REV	DATE	DESCRIPTION

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PROJ. NO.	2023021.01
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CHECKED	GPB
DATE	12/15/23

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ROOF PLAN - SUPPORT BLDG.

SHEET NO:

A-102

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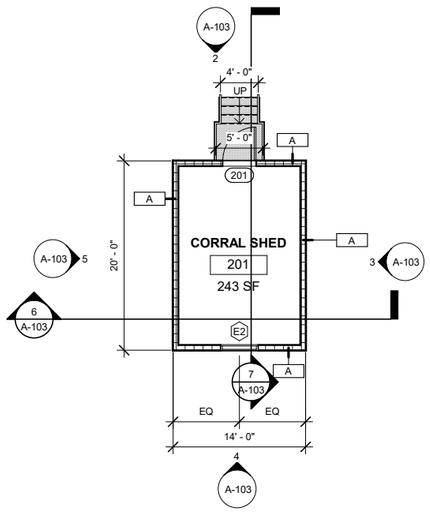
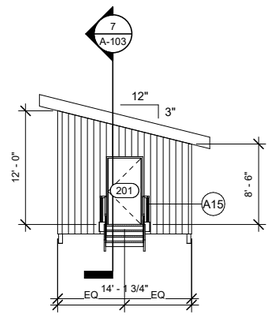
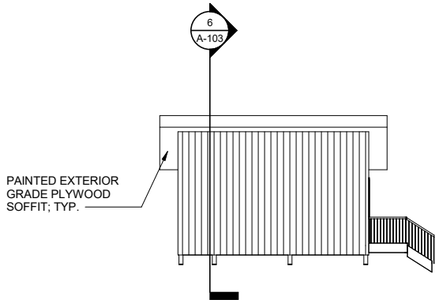


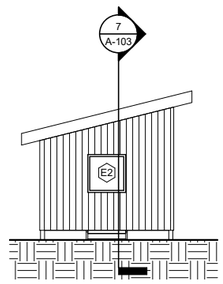
1 FLOOR PLAN - CORRAL SHED
A-103 — 1/8" = 1'-0"



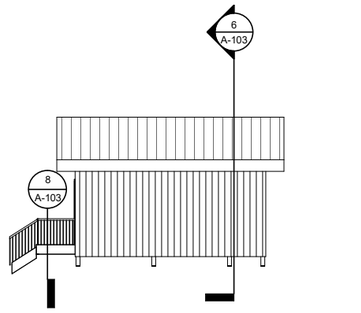
2 NORTH - SHED
A-103 — 1/8" = 1'-0"



3 EAST - SHED
A-103 — 1/8" = 1'-0"



4 SOUTH - SHED
A-103 — 1/8" = 1'-0"



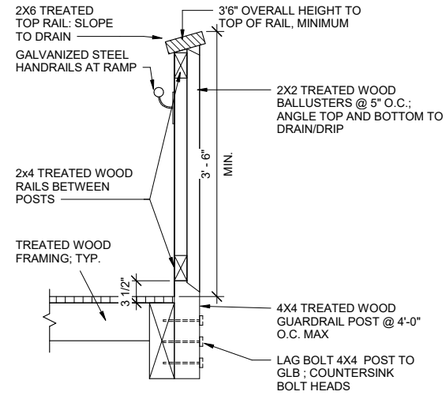
5 WEST - SHED
A-103 — 1/8" = 1'-0"

KEYNOTES

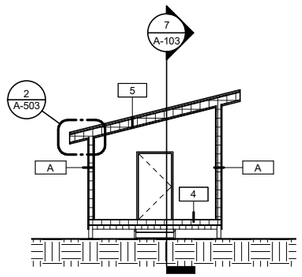
A15 PRESSURE TREATED WOOD STAIR AND GUARDRAIL W/GALVANIZED STELL HANDRAILS

FLOOR PLAN LEGEND

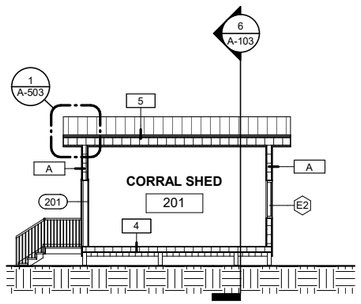
- A1 — SHEET NOTES
- E1 — WINDOW TAG
- A — WALL TAG
- 101 — DOOR TAG



8 DECK/STAIR GUARDRAIL
A-103 — 1" = 1'-0"



6 SECTION 1 - SHED
A-103 — 1/8" = 1'-0"



7 SECTION 2 - SHED
A-103 — 1/8" = 1'-0"

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STATE OF ALASKA — Garrett P. Burtner — No. 12683 — REGISTERED PROFESSIONAL ENGINEER
12/15/23

MCG EXPLORE DESIGN

KAWERAK, INC.

SAVOONGA REINDEER PROCESSING FACILITY

PERMIT DOCUMENTS

BID DOCUMENTS

REV	DATE	DESCRIPTION
-		

PROJ. NO.	2023021.01
DRAWN	SP
CHECKED	GPB
DATE	12/15/23

SHEET TITLE:

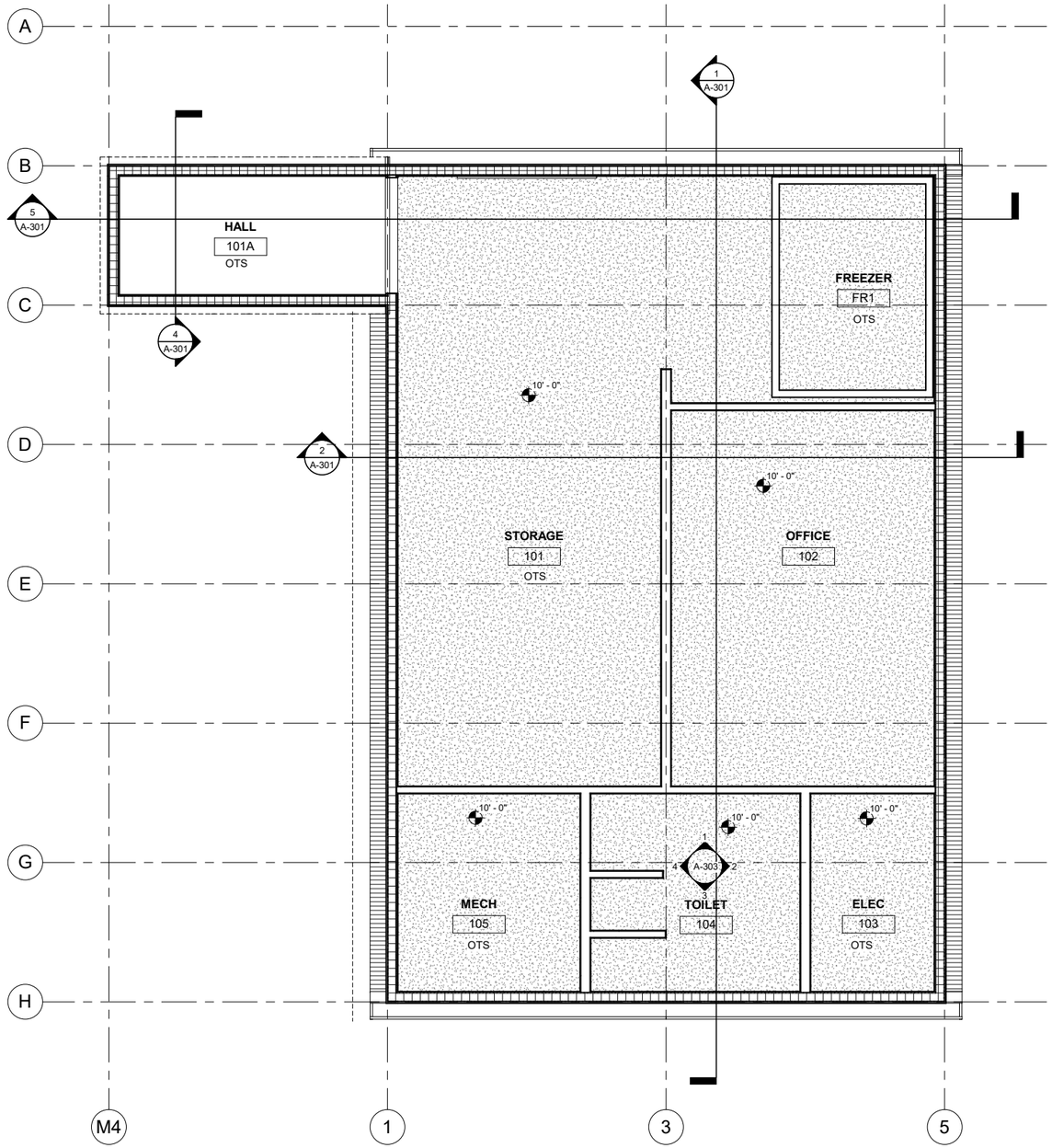
CORRAL STORAGE SHED

SHEET NO:

A-103

SHEET OF

12/15/2023 4:06:54 PM



NORTH

1 A-104 REFLECTED CEILING PLAN - LEVEL 1

1/4" = 1'-0"

RCP LEGEND

1/4" SCALE, REFTER TO INTERIOR FINISH LEGEND FOR MORE INFORMATION

- GWB, PAINTED
- WD1
- 8' - 0" ELEVATION TAG
- OPEN TO STRUCTURE PAINTED

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STATE OF ALASKA
Garrett P. Burtner
No. 12683
12/15/23

MCG EXPLORE DESIGN

KAWERAK, INC.

SAVOONGA REINDEER PROCESSING FACILITY

PERMIT DOCUMENTS

REV	DATE	DESCRIPTION

BID DOCUMENTS

PROJ. NO.	2023021.01
DRAWN	Author
CHECKED	Checker
DATE	12/15/23

SHEET TITLE:

REFLECTED CEILING PLAN

SHEET NO:

A-104

SHEET OF

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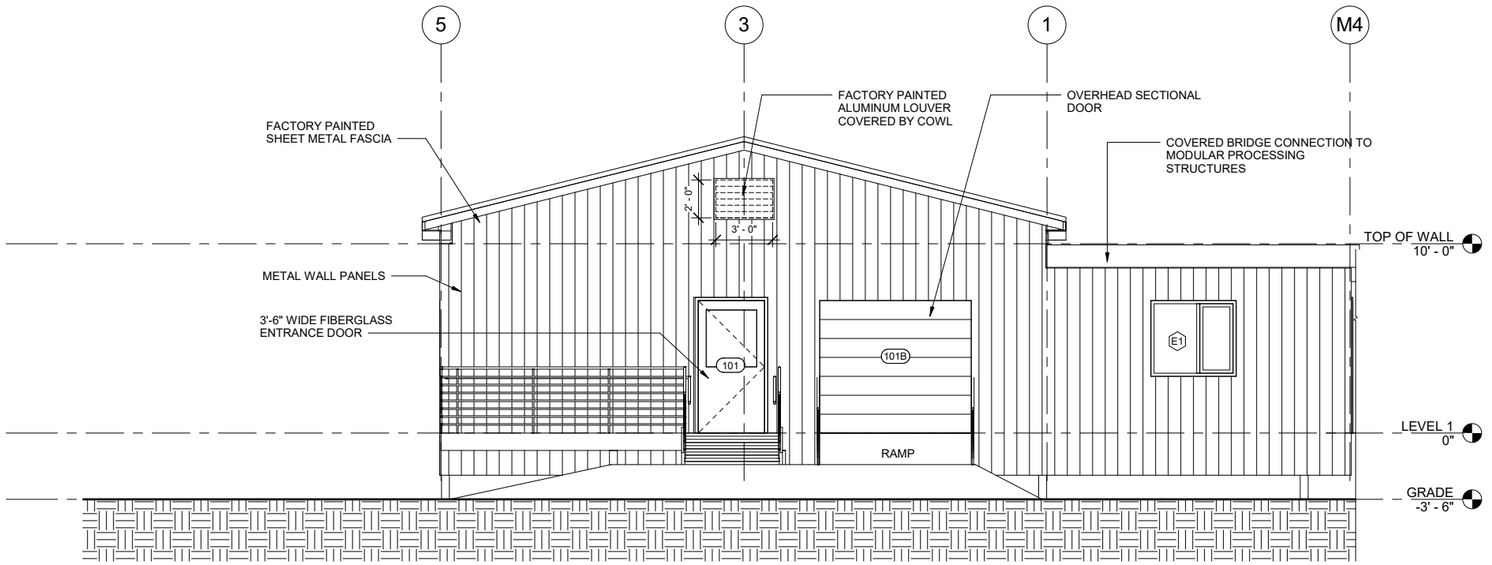
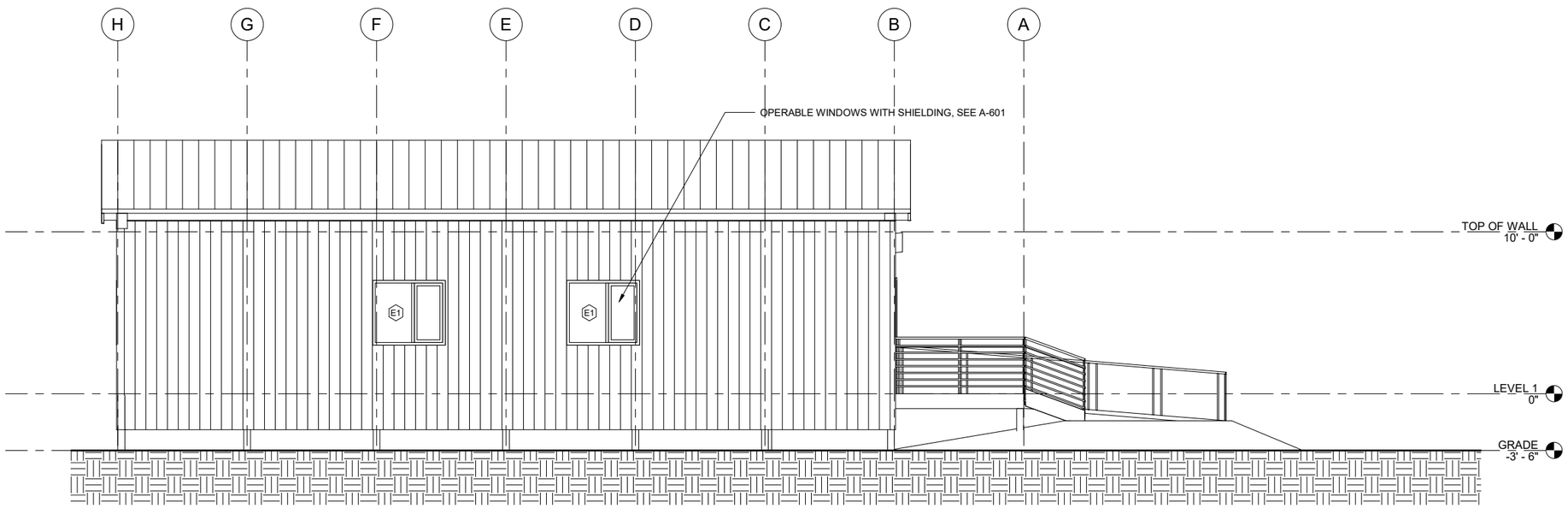


1 A-201 NORTH - SUPPORT
1/4" = 1'-0"



2 A-201 EAST - SUPPORT
1/4" = 1'-0"

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STATE OF ALASKA
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No. 12683
12/15/23

MCG EXPLORE DESIGN

KAWERAK, INC.

SAVOONGA REINDEER PROCESSING FACILITY

PERMIT DOCUMENTS

REV	DATE	DESCRIPTION

BID DOCUMENTS

PROJ. NO.	2023021.01
DRAWN	SP
CHECKED	Checker
DATE	12/15/23

SHEET TITLE:

EXTERIOR ELEVATIONS

SHEET NO:

A-201

SHEET OF

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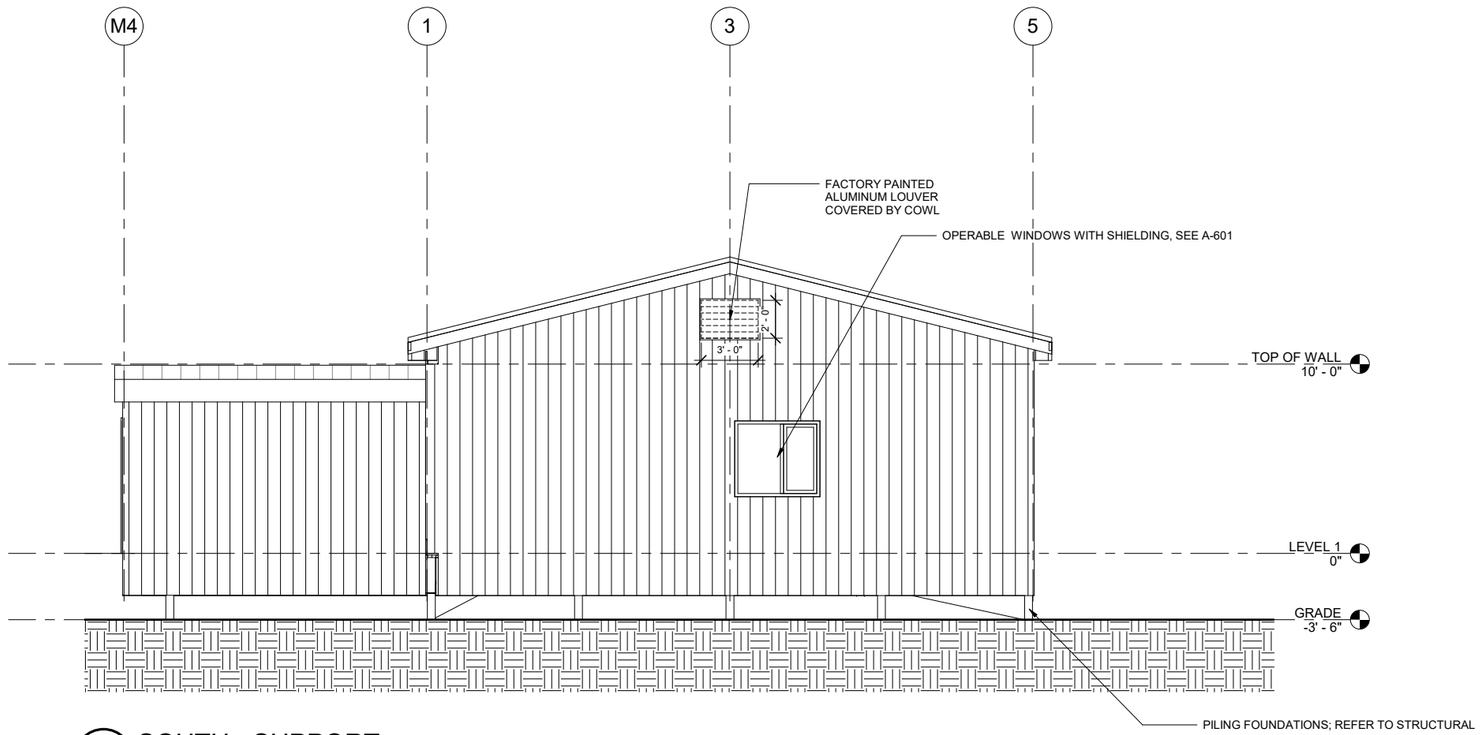
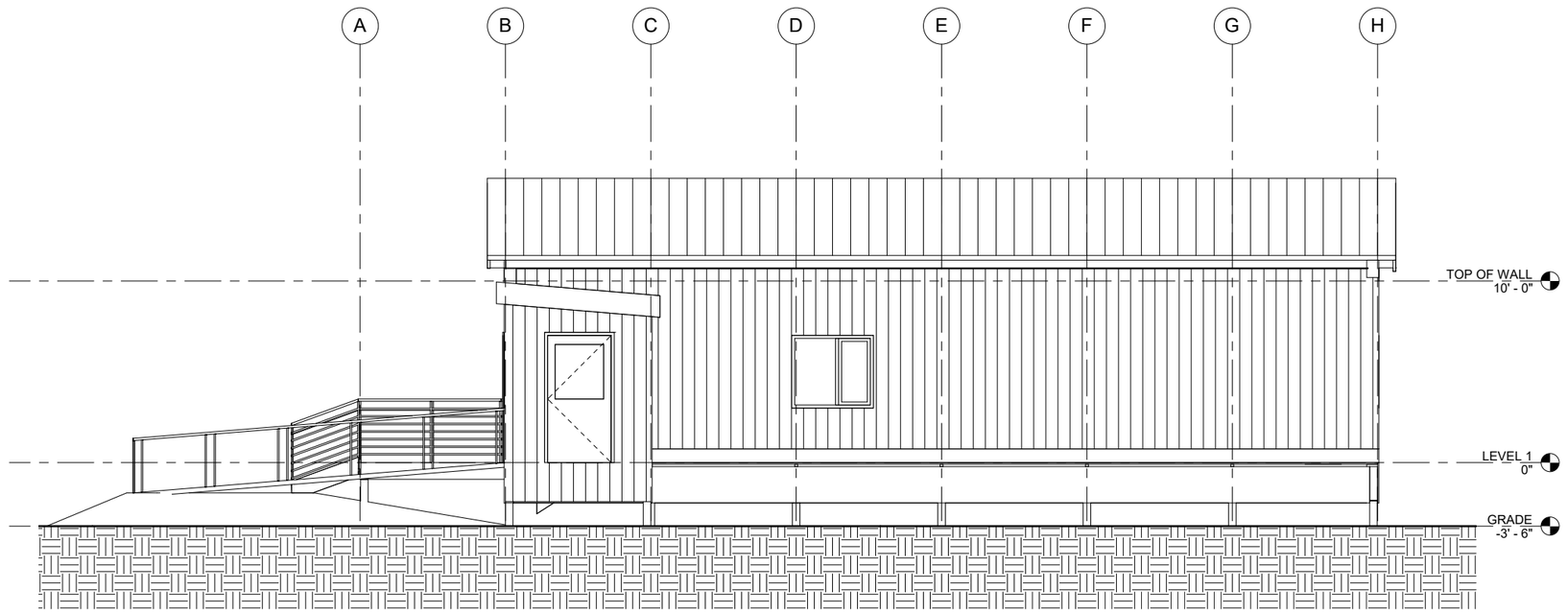


1 A-202 SOUTH - SUPPORT

1/4" = 1'-0"



2 A-202 WEST - SUPPORT

1/4" = 1'-0"

12/15/2023 4:06:59 PM

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MCG EXPLORE DESIGN

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DRAWN	SP
CHECKED	GR
DATE	12/15/23

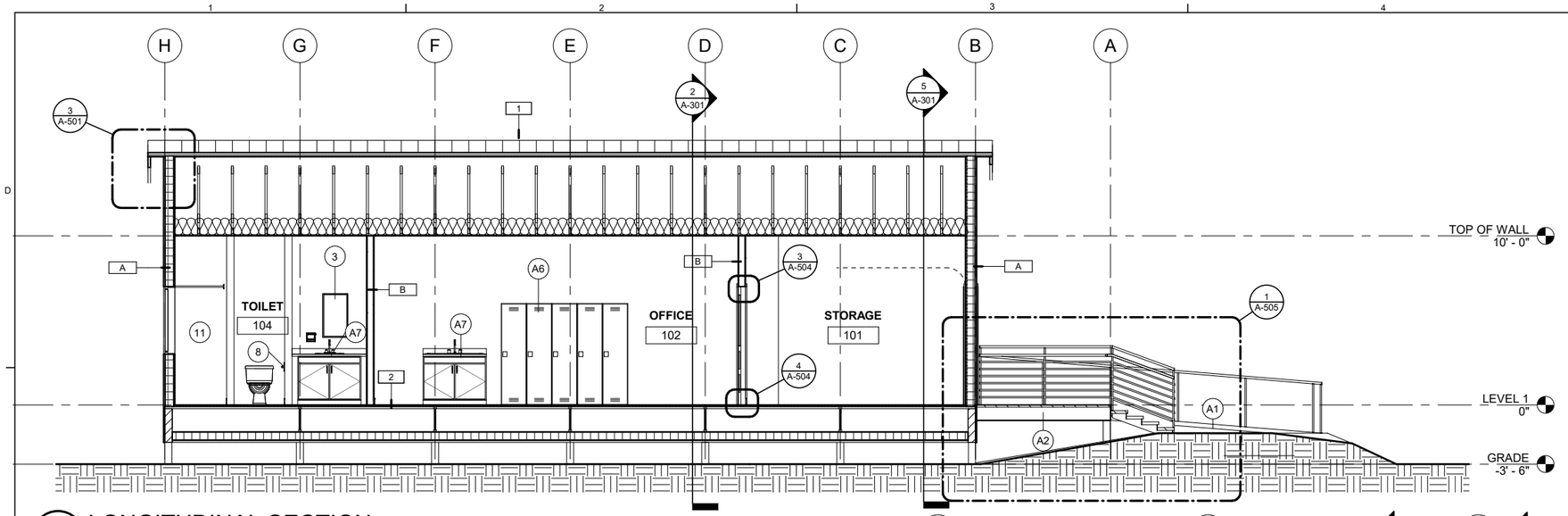
SHEET TITLE:

EXTERIOR ELEVATONS

SHEET NO:

A-202

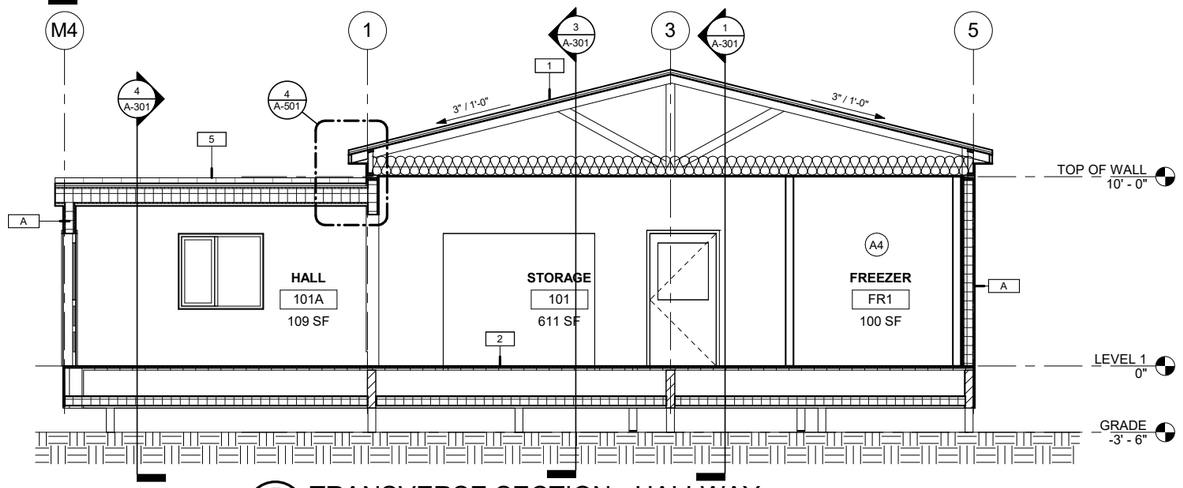
SHEET OF



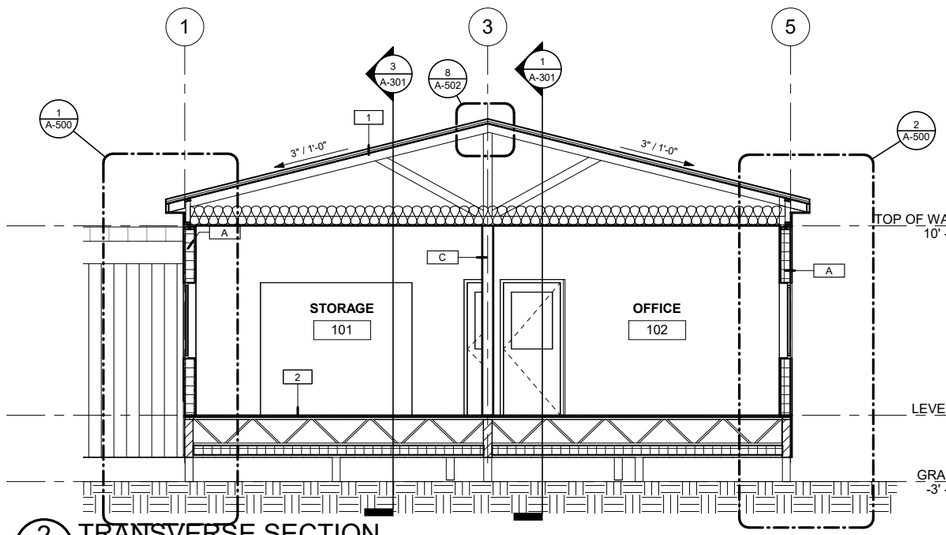
1 A-301 LONGITUDINAL SECTION
1/4" = 1'-0"

KEYNOTES

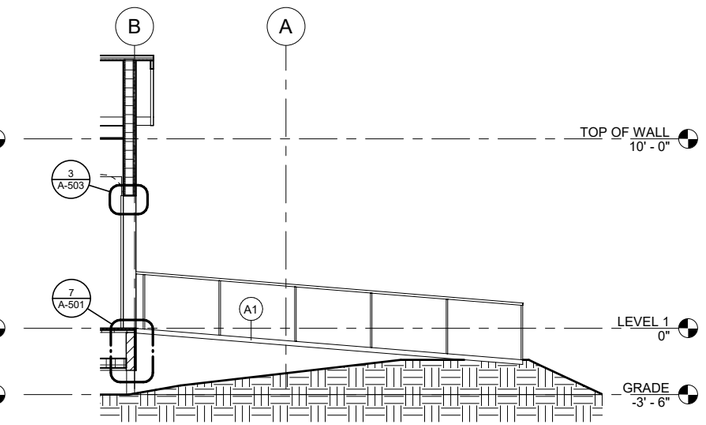
3	24" X 36" MIRROR & SHELF
8	TOILET PAPER DISPENSER
11	ACCESSIBLE TUB/HOWER UNIT; PROVIDE GRAB BARS AND SEAT; REFER TO MECHANICAL DRAWINGS
A1	RAMP; TREATED METAL FRAMING WITH GALVANIZED STEEL GRATING
A2	STAIR AND DECK; TREATED TIMBER FRAMING WITH GALVANIZED STEEL GRATING
A4	PACKAGED WALK-IN FREEZER UNIT; TRIM TO SURROUNDING CONSTRUCTION; REFER TO MECHANICAL
A6	METAL LOCKERS; 1'6"W X 1'6"D X 6'H
A7	SOLID SURFACE COUNTERTOP WITH SINK & CASEWORK, SEE 1/A-503



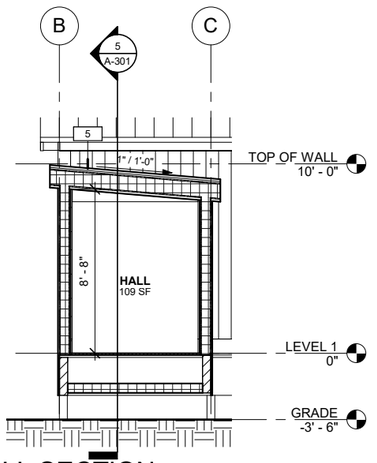
5 A-301 TRANSVERSE SECTION - HALLWAY
1/4" = 1'-0"



2 A-301 TRANSVERSE SECTION
1/4" = 1'-0"



3 A-301 RAMP SECTION
1/4" = 1'-0"



4 A-301 HALL SECTION
1/4" = 1'-0"

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KAWERAK, INC.

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PROJ. NO.	2023021.01
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CHECKED	Checker
DATE	12/15/23

SHEET TITLE:
BUILDING SECTIONS

SHEET NO:
A-301

SHEET OF

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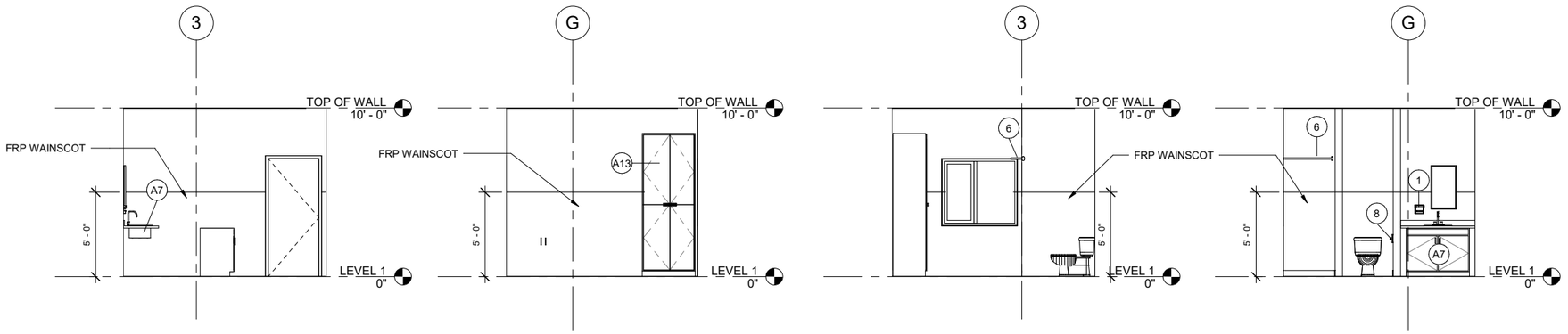

1 A-303 TOILET - NORTH 1/4" = 1'-0"

2 A-303 TOILET - EAST 1/4" = 1'-0"

3 A-303 TOILET - SOUTH 1/4" = 1'-0"

4 A-303 TOILET - WEST 1/4" = 1'-0"

KEYNOTES

1	SOAP DISPENSER
6	SHOWER CURTAIN AND ROD
8	TOILET PAPER DISPENSER
A7	SOLID SURFACE COUNTERTOP WITH SINK & CASEWORK, SEE 1/A-503
A13	TALL CABINET, SEE 2/A-503

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PROJ. NO.	2023021.01
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DATE	12/15/23

SHEET TITLE:

INTERIOR ELEVATIONS

SHEET NO:

A-303

SHEET OF

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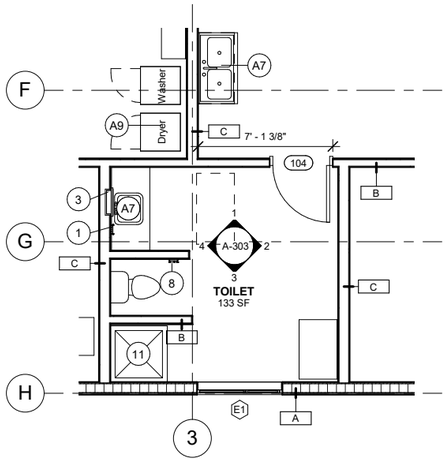
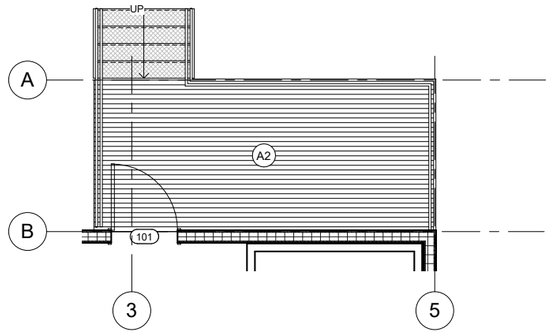
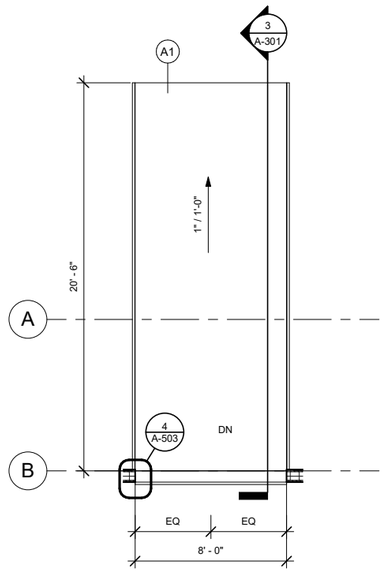


1 A-401 ENLARGED TOILET ROOM PLAN
1/4" = 1'-0"



2 A-401 ENLARGED STAIR PLAN - ENTRY
1/4" = 1'-0"



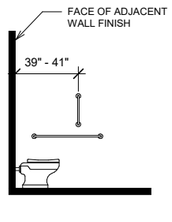
3 A-401 ENLARGED RAMP PLAN
1/4" = 1'-0"

KEYNOTES

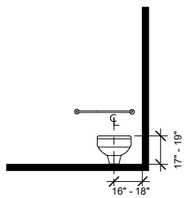
1	SOAP DISPENSER
3	24" X 36" MIRROR & SHELF
8	TOILET PAPER DISPENSER
11	ACCESSIBLE TUB/HOWER UNIT; PROVIDE GRAB BARS AND SEAT; REFER TO MECHANICAL DRAWINGS
A1	RAMP; TREATED METAL FRAMING WITH GALVANIZED STEEL GRATING
A2	STAIR AND DECK; TREATED TIMBER FRAMING WITH GALVANIZED STEEL GRATING
A7	SOLID SURFACE COUNTERTOP WITH SINK & CASEWORK, SEE 1/A-503
A9	WASHER OR DRYER UNIT

ACCESSIBLE MOUNTING HEIGHTS AND GENERAL NOTES

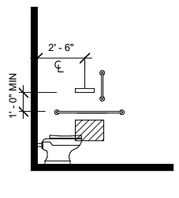
1. WATER SUPPLY AND DRAIN PIPES UNDER LAVATORIES AND SINK SHALL BE INSULATED OR OTHERWISE CONFIGURED TO PROTECT AGAINST CONTACT.
2. THERE SHALL BE NO ABRASIVE SURFACE UNDER LAVATORIES OR SINKS.
   THIS FACILITY WILL FOLLOW ANSI 117.1 IN ACCORDANCE WITH IBC 2012 CHAPTER 11, 1101.2



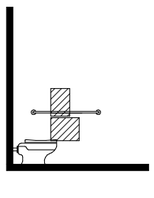
WALL MOUNTED GRAB BARS AT SIDEWALL (GB)



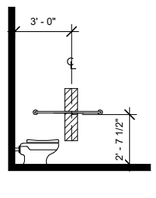
FLOOR MOUNTED WATER CLOSET (WC) AND GRAB BAR



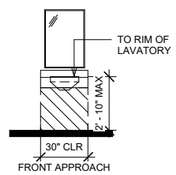
ANSI PROTRUDING DISPENSER(S)



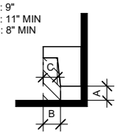
ANSI RECESSED DISPENSER(S)



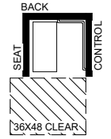
ADA 2010 DISPENSER(S)



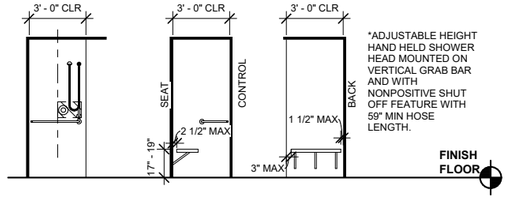
LAVATORY (LAV) MIRROR (MR)



ANSI / ADA 2010 KNEE CLEARANCES



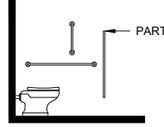
ANSI TRANSFER SHOWER



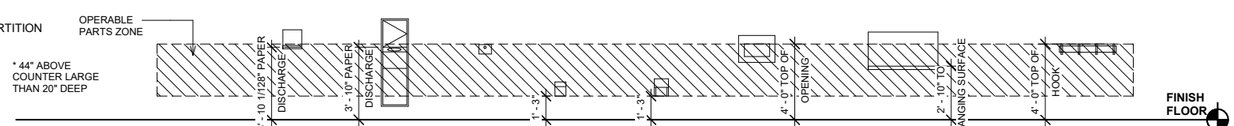
ANSI / ADA 2010 TRANSFER SHOWER CONTROL WALL

ANSI / ADA 2010 TRANSFER SHOWER BACK WALL

ANSI / ADA 2010 TRANSFER SHOWER SEAT WALL



WHEELCHAIR ACCESSIBLE COMPARTMENT TOE CLARENCE



ADAM 2010 / ANSI REACH RANGES

PAPER TOWEL DISPENSER (PTD)

PAPER TOWEL DISPENSER/R ECEPTACLE (PTDR)

SOAP DISPENSER (SD)

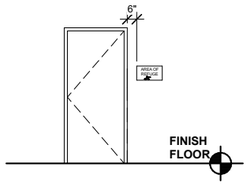
SANITARY NAPKIN DISPENSER (SND)

TOILET TISSUE DISPENSER (SND)

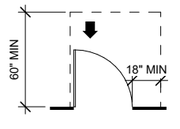
TOILET SEAT COVER DISPENSER (TSC)

BABY CHANGING STATION (BCS)

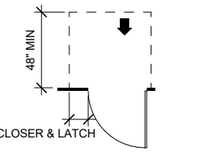
HOOKS (HK)



ANSI SIGNAGE MOUNTING HEIGHTS



FRONT APPROACH, PULL SIDE



FRONT APPROACH, PUSH SIDE

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MCG EXPLORE DESIGN

KAWERAK, INC.

SAVOONGA REINDEER PROCESSING FACILITY

PERMIT DOCUMENTS

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PROJ. NO.	2023021.01
DRAWN	Author
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DATE	12/15/23

SHEET TITLE:
ENLARGED PLANS

SHEET NO:
A-401

SHEET OF

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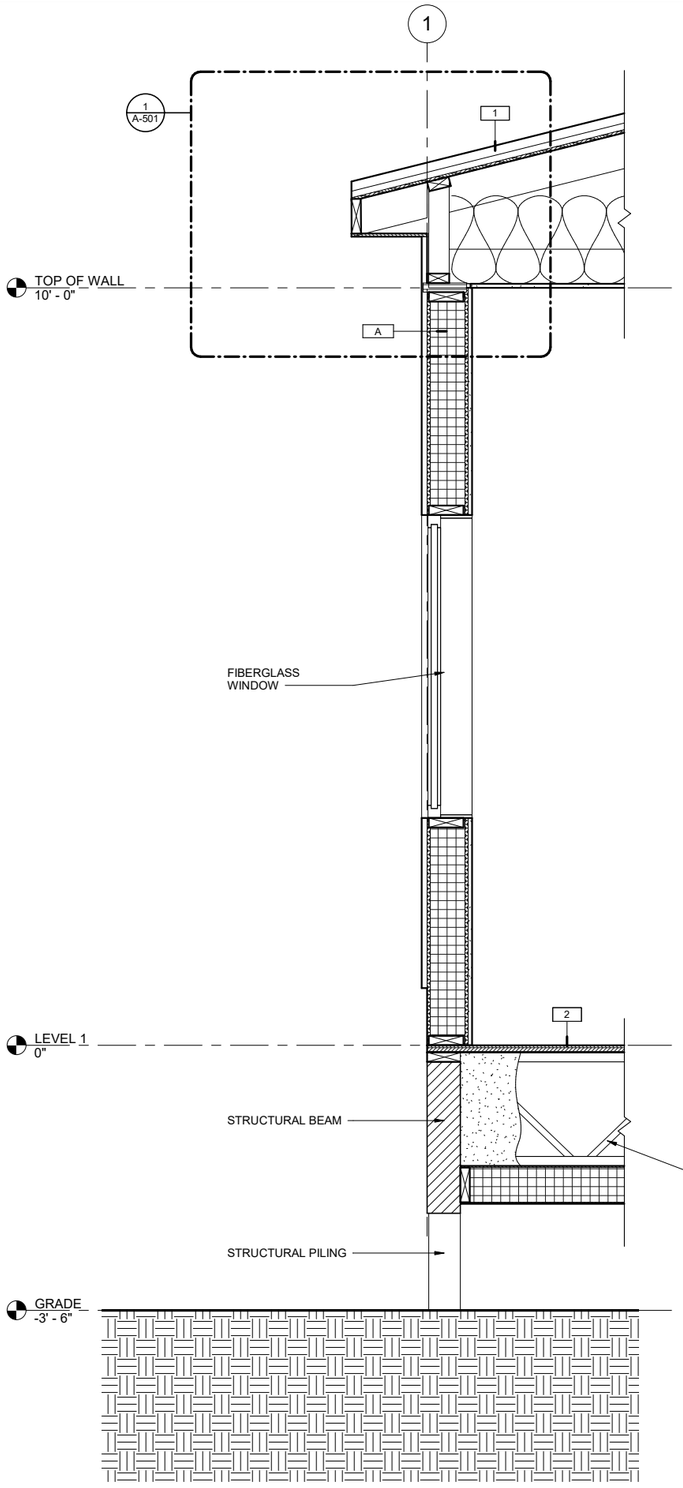
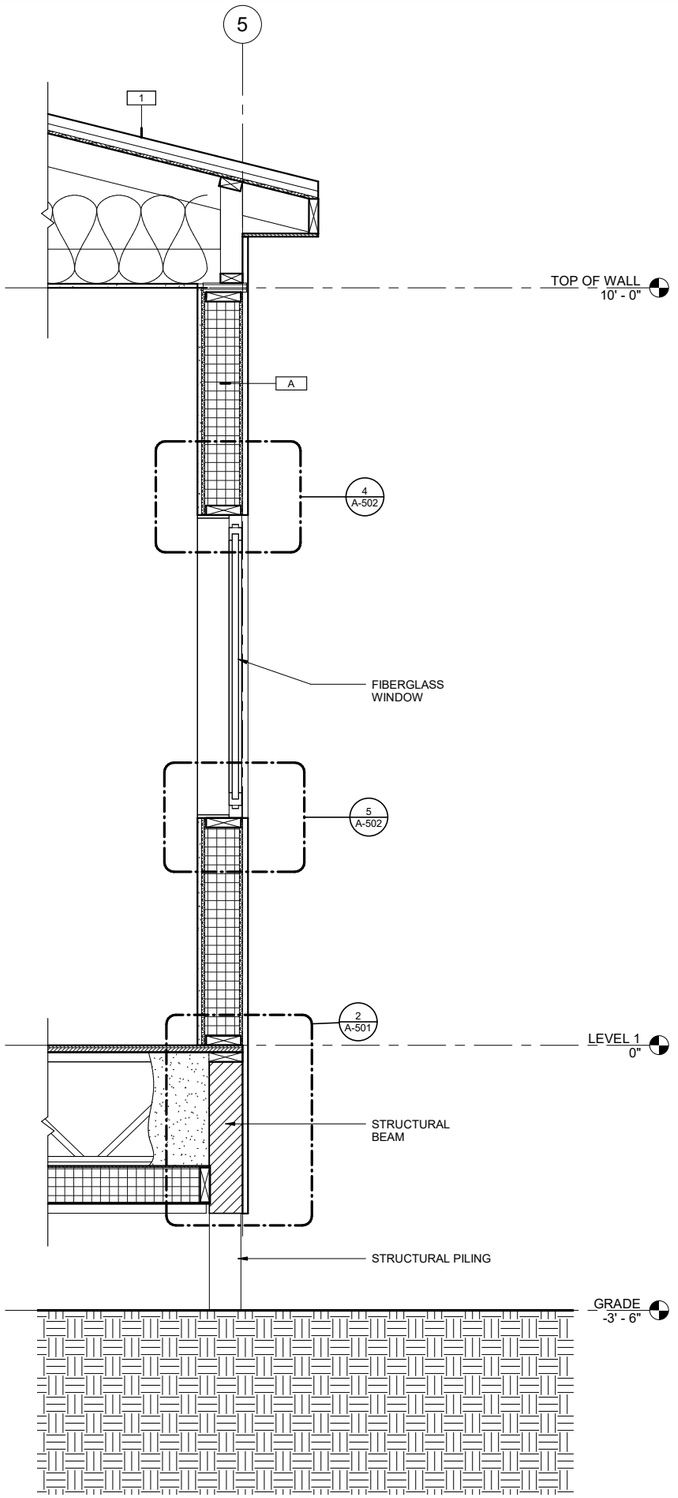


1 A-500 WALL SECTION - GRID 1
1" = 1'-0"



2 A-500 WALL SECTION - GRID 5
1" = 1'-0"

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DRAWN	Author
CHECKED	Checker
DATE	12/15/23

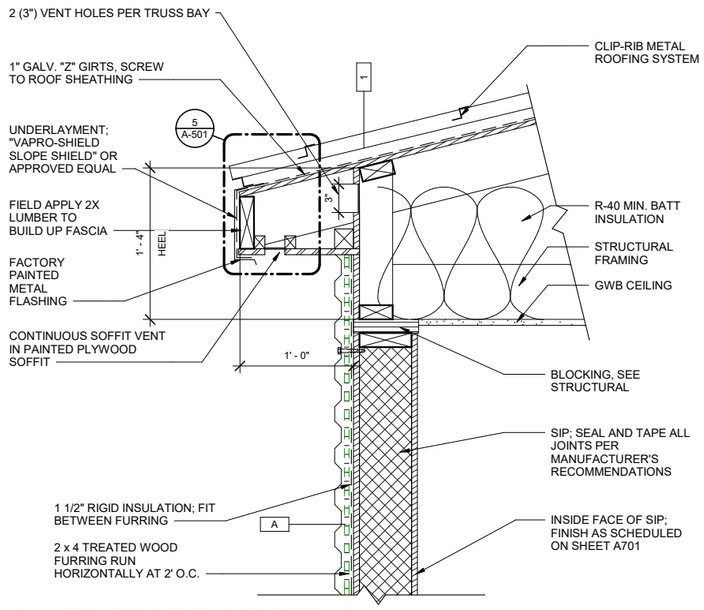
SHEET TITLE:

WALL SECTIONS

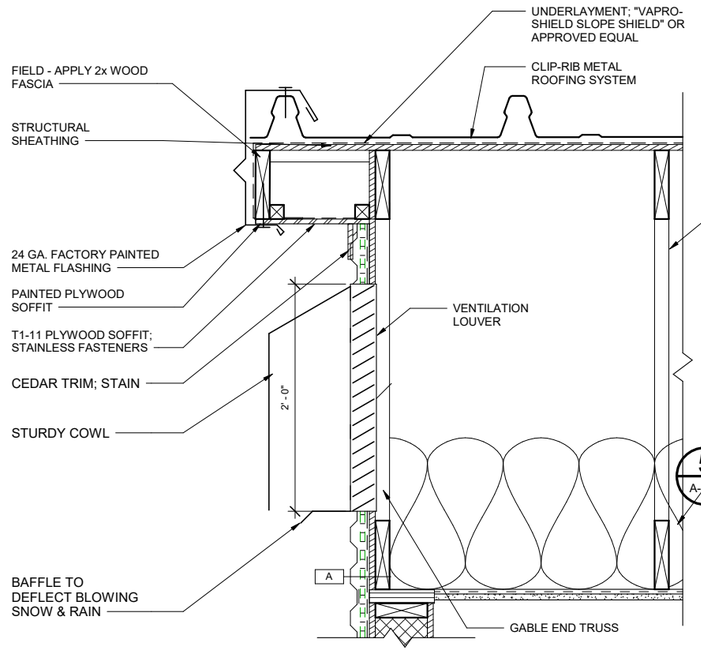
SHEET NO:

A-500

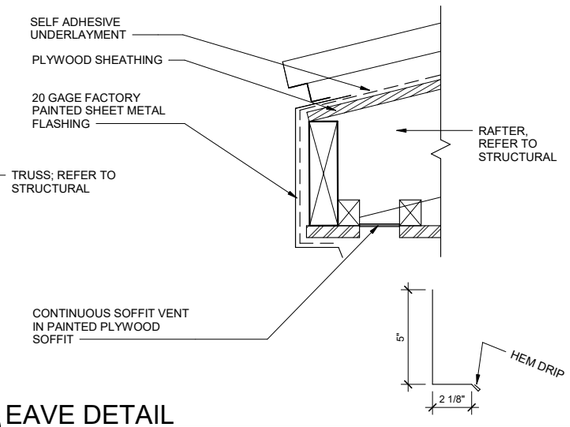
SHEET OF



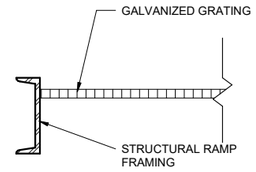
1 WALL TO ROOF EAVE DETAIL
A-501 — 1 1/2" = 1'-0"

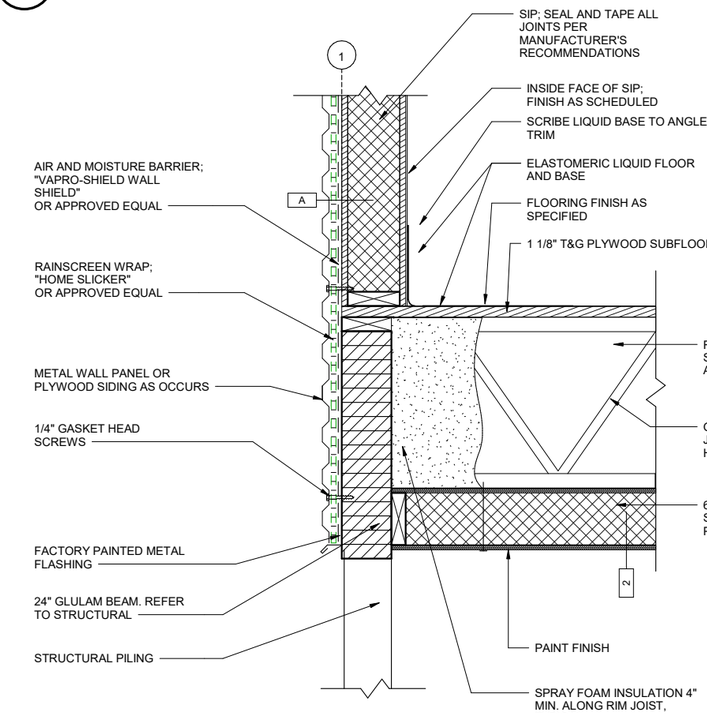


3 ROOF RAKE DETAIL
A-501 — 1 1/2" = 1'-0"

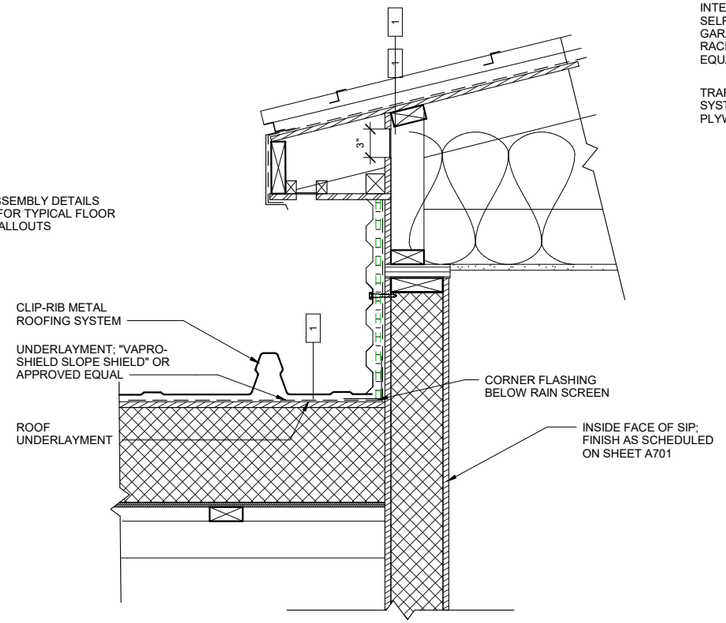


5 EAVE DETAIL
A-501 — 3" = 1'-0"

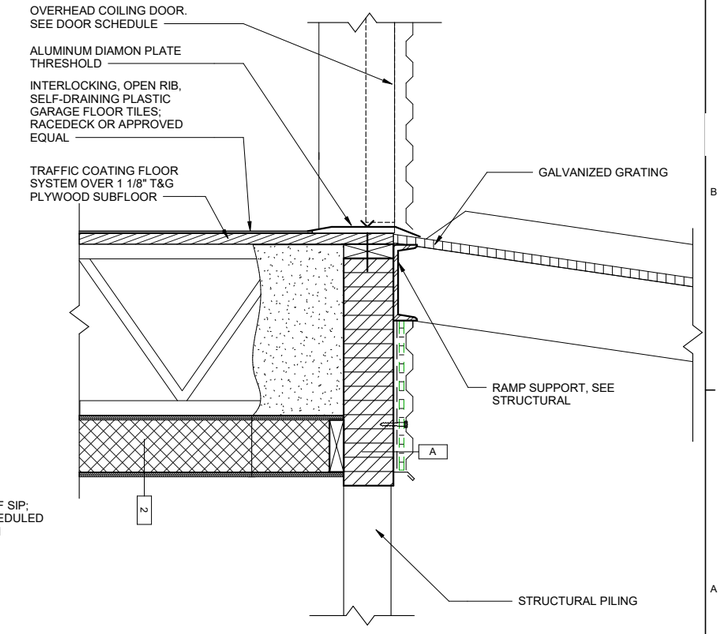




2 WALL TO FLOOR DETAIL
A-501 — 1 1/2" = 1'-0"



4 ROOF SIDE WALL
A-501 — 1 1/2" = 1'-0"



6 FLOOR TO RAMP DETAIL CROSS SECTION
A-501 — 1 1/2" = 1'-0"

7 FLOOR TO RAMP DETAIL
A-501 — 1 1/2" = 1'-0"

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SHEET TITLE:
DETAILS

SHEET NO:
A-501

SHEET OF

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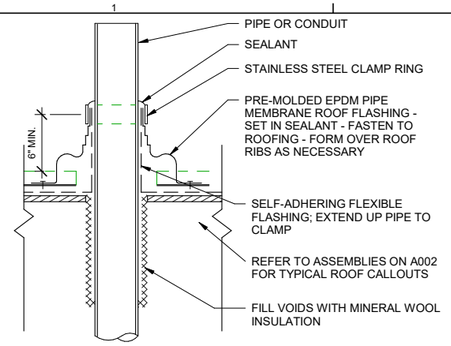
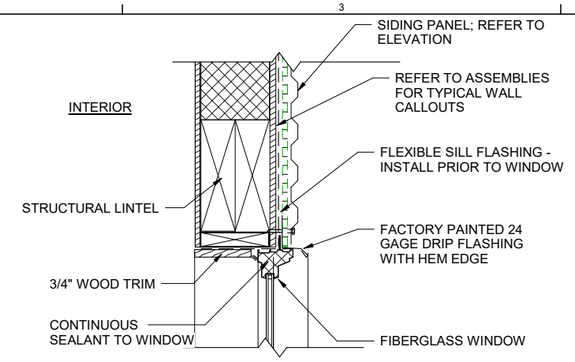


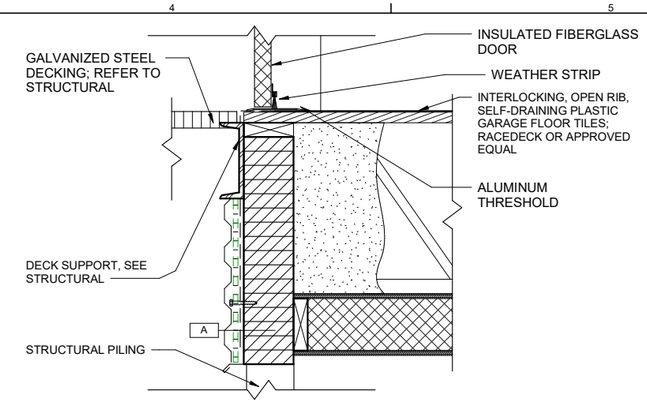
1 A-502 PIPE PENETRATIONS AT ROOF

1 1/2" = 1'-0"



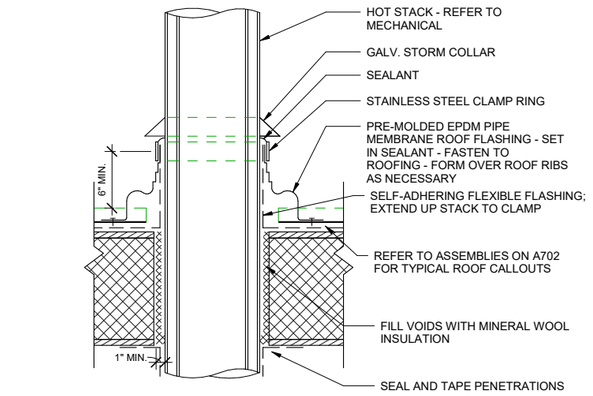
4 A-502 EXTERIOR WINDOW HEAD - JAMB SIL.

1 1/2" = 1'-0"



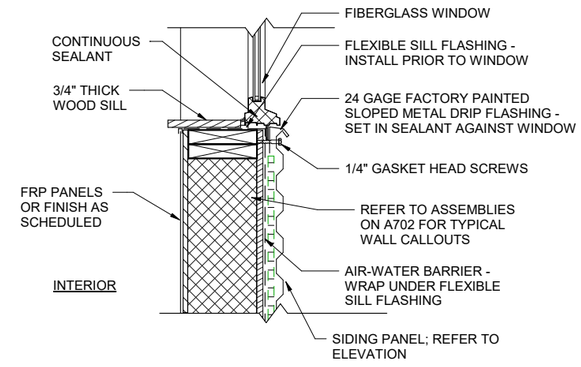
7 A-502 EXTERIOR DOOR SILL

1 1/2" = 1'-0"



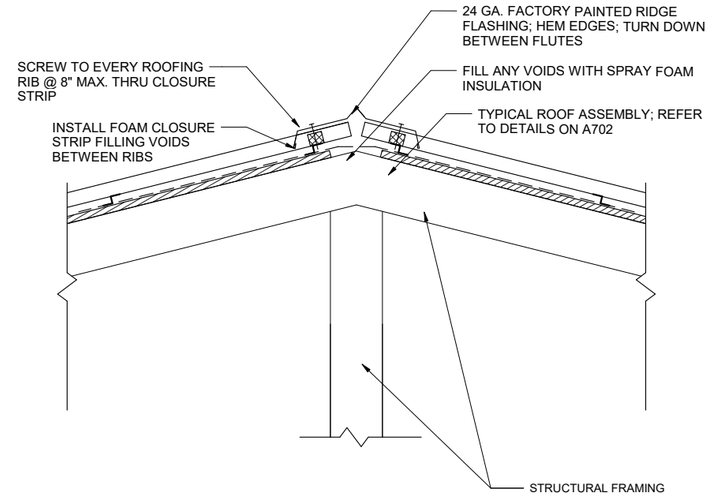
2 A-502 HOT STACK ROOF PENETRATIONS

1 1/2" = 1'-0"



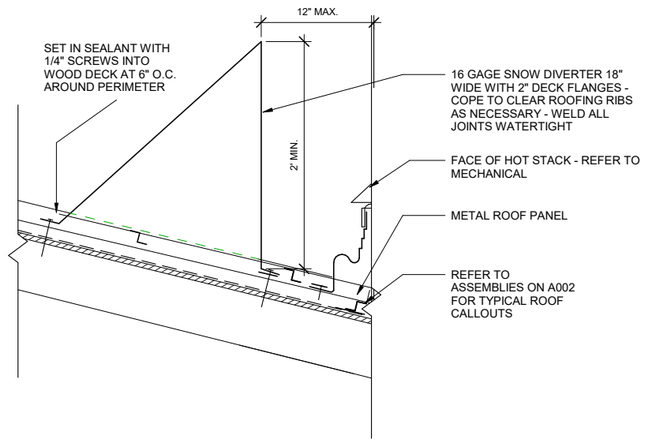
5 A-502 EXTERIOR WINDOW SILL

1 1/2" = 1'-0"



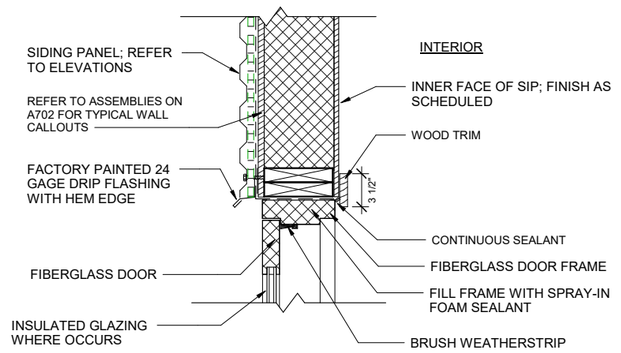
8 A-502 ROOF RIDGE DETAIL

1 1/2" = 1'-0"



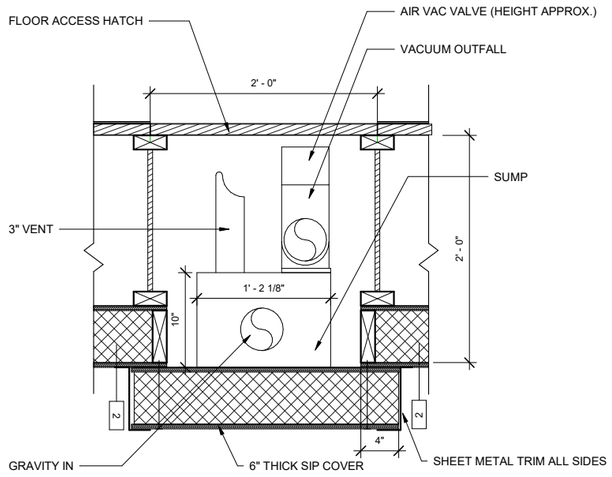
3 A-502 SNOW DIVERTER DETAIL

1 1/2" = 1'-0"



6 A-502 EXTERIOR DOOR HEAD - JAMB SIM.

1 1/2" = 1'-0"



9 A-502 VAC. SUMP UTILIDOR DETAIL

1 1/2" = 1'-0"

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MCG EXPLORE DESIGN

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SAVOONGA REINDEER PROCESSING FACILITY

PERMIT DOCUMENTS

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SHEET TITLE:

DETAILS

SHEET NO:

A-502

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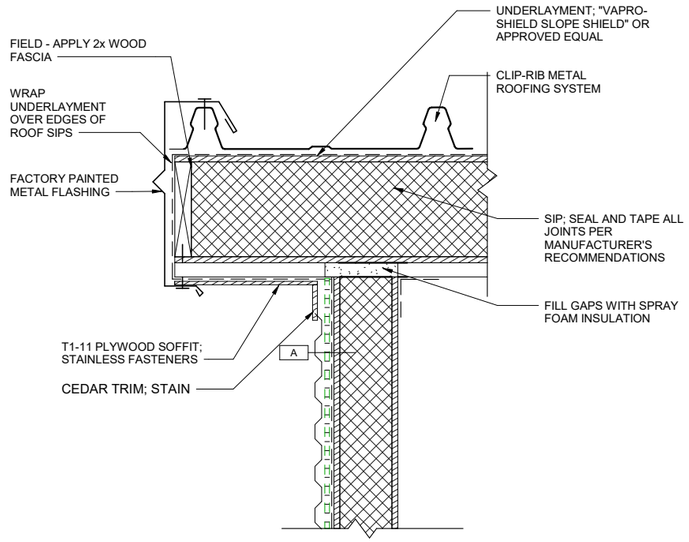
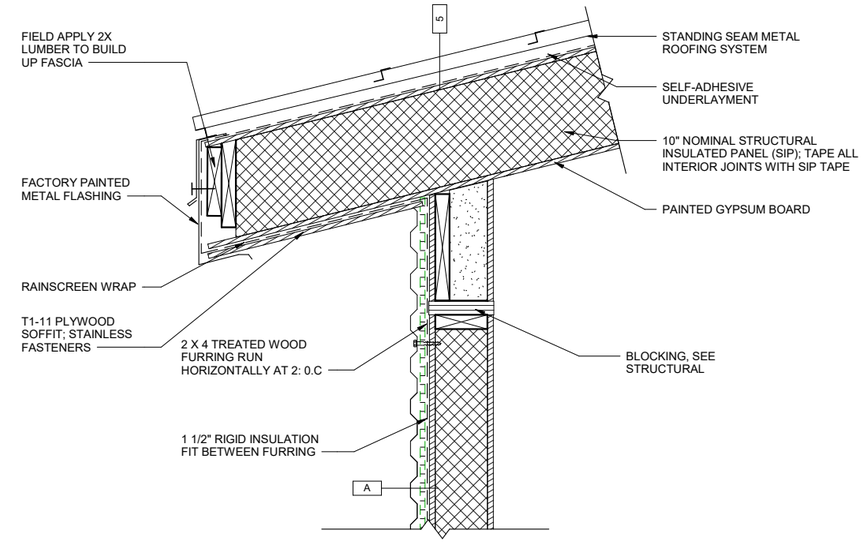
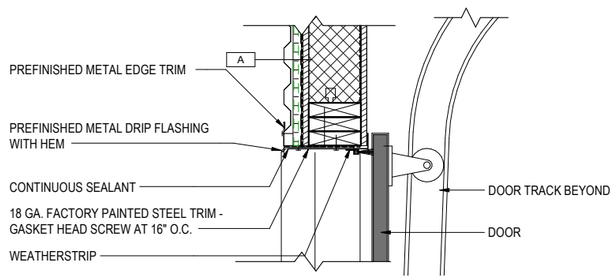


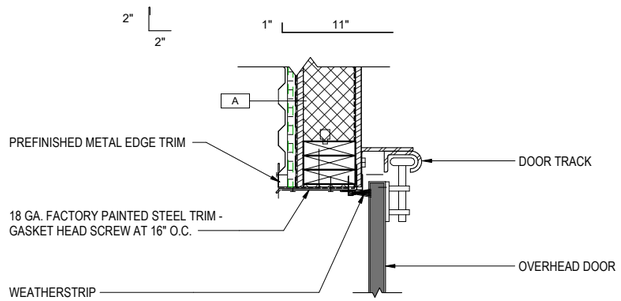
1 ROOF RAKE DETAIL - CORRAL SHED
A-503 — 1 1/2" = 1'-0"



2 ROOF EAVE DETAIL - CORRAL SHED
A-503 — 1 1/2" = 1'-0"



3 EXTERIOR OVERHEAD DOOR HEAD
A-503 — 1 1/2" = 1'-0"



4 EXTERIOR OVERHEAD DOOR JAMB
A-503 — 1 1/2" = 1'-0"

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DETAILS

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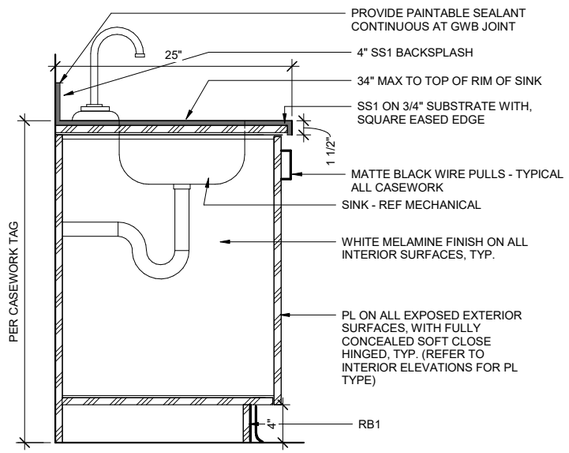
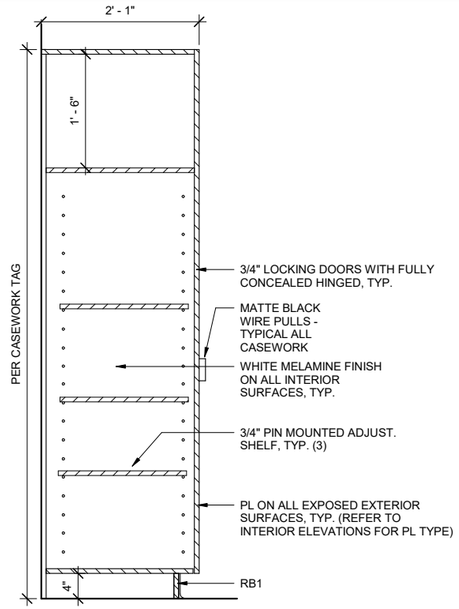


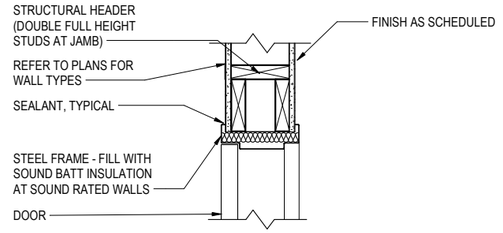
1 SECTION DETAIL - (SB) SINK BASE

A-504 — 1 1/2" = 1'-0"



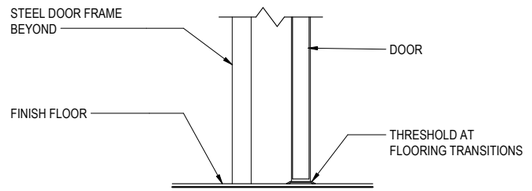
2 SECTION DETAIL - (TC) TALL CBNT

A-504 — 1" = 1'-0"



3 INTERIOR DOOR HEAD (JAMB SIM)

A-504 — 1 1/2" = 1'-0"



4 INTERIOR DOOR SILL

A-504 — 1 1/2" = 1'-0"

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INTERIOR DETAILS

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A-504

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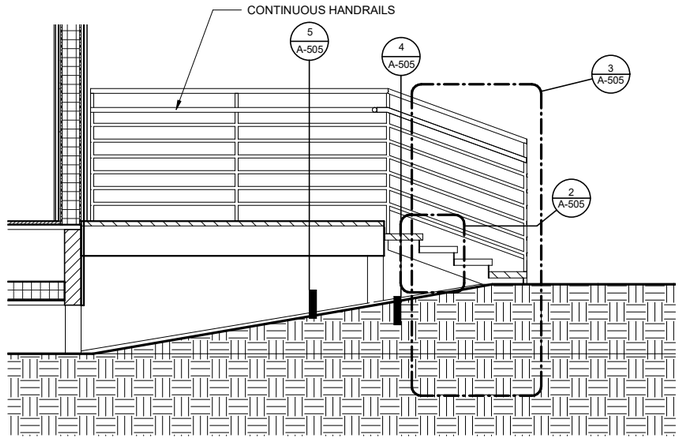
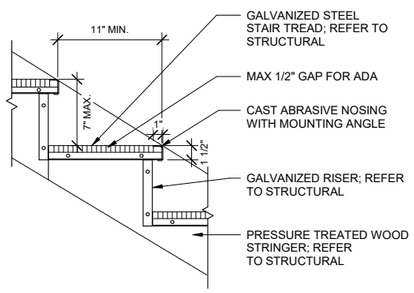
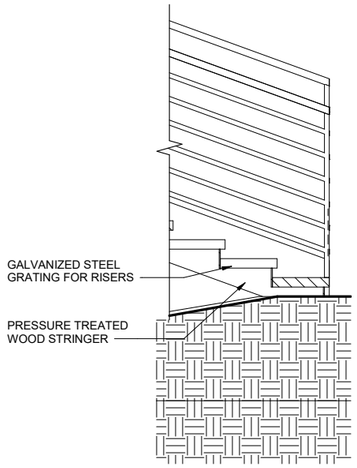


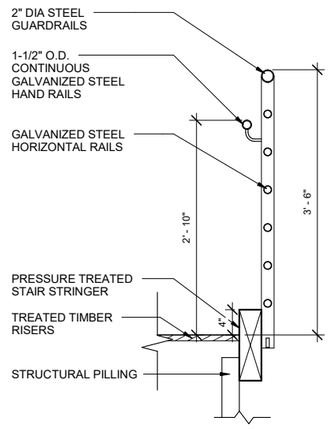
1 STAIR SECTION AT ENTRY
A-505 — 1/2" = 1'-0"



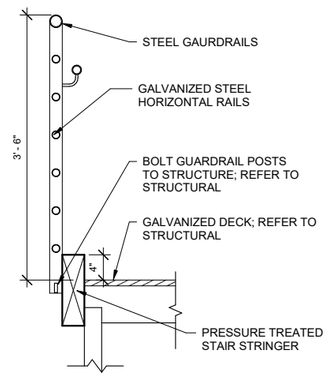
2 STAIR TREAD DETAIL
A-505 — 1 1/2" = 1'-0"



3 GUARDRAIL ELEVATION
A-505 — 3/4" = 1'-0"



4 GUARDRAIL SECTION AT STAIR
A-505 — 1" = 1'-0"



5 GUARDRAIL SECTION AT DECK
A-505 — 1" = 1'-0"

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STAIR SECTIONS AND DETAILS

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ROOM FINISH SCHEDULE

ROOM NO.	ROOM NAME	FLOOR FIN.	FLOOR BASE	N WALL FINISH	E WALL FINISH	S WALL FINISH	W WALL FINISH	CEILING FIN.	COMMENTS
101	STORAGE	PTC	PLY	GWB + FRP	GWB + FRP	GWB + FRP	GWB + FRP	GWB	(2) (3)
101A	HALL	PTC	PLY	GWB + FRP	GWB + FRP	GWB + FRP	GWB + FRP	EXP	(2) (3)
102	OFFICE	RES	PLY	GWB	GWB	GWB	GWB	GWB	
103	ELEC	RES	PLY	GWB	GWB	GWB	GWB	GWB	
104	TOILET	FRP	PLY	GWB + FRP	GWB + FRP	GWB + FRP	GWB + FRP	GWB	(1)
105	MECH	RES	PLY	GWB	GWB	GWB	GWB	GWB	
201	CORRAL SHED	T. PLY	PLY	GWB	GWB	GWB	GWB	EXP	
FR1	FREEZER	PTC	PLY						(5)

FINISH SCHEDULE ABBREVIATIONS

(1)	NOTE; REFER TO FINISH SCHEDULE NOTES ON THIS SHEET
ACT	SUSPENDED ACOUSTIC CEILING
ELF	ELASTOMERIC LIQUID FLOORING AND BASE; REFER TO SPECIFICATION SECTION 09670
EXP	EXPOSED STRUCTURE; PAINT AS INDICATED
FF	FACTORY FINISH
FRP1	FIBERGLASS REINFORCED PLASTIC PANELING - TYPE 1
FRP2	FIBERGLASS REINFORCED PLASTIC PANELING - TYPE 2
GFL	GARAGE FLOOR TILES - INTERLOCKING, OPEN RIB, SELF-DRAINING PLASTIC GARAGE FLOOR TILES. RACEDECK OR APPROVED EQUAL.
GWB	GYPSUM BOARD CEILING; PAINT AS INDICATED
LAF	LIQUID APPLIED FLOORING
N	NONE/NOT APPLICABLE
PLY	PLYWOOD
PTC	PTC PEDESTRIAN TRAFFIC COATING FLOOR AND BASE; REFER TO SPECIFICATION SECTION 07 18 13
T. PLY	TREATED PLYWOOD
P1	PAINT; COLOR INDICATED BY NUMBER; REFER TO SPECIFICATION SECTION 09910
RES	RESILIENT LINOLEUM

FINISH SCHEDULE NOTES

(1) INSTALL WALL FINISH AS WAINSCOT TO HEIGHT INDICATED ON INTERIOR ELEVATIONS; PAINTED GYPSUM BOARD ABOVE

(2) 8' FRP WAINSCOT ABOVE WALL BASE; PAINT WALL ABOVE

(3) INSTALL INTERLOCKING, OPEN RIB, SELF-DRAINING PLASTIC GARAGE FLOOR TILES OVER PTC FLOOR; BIG FLOOR RACEDECK OR APPROVED EQUAL.

(4) WALK-IN FREEZER HAS INTEGRATED FLOOR PANELS THAT WILL INSTALL OVER THE PTC.

(5) WALK-IN FREEZER HAS INTEGRATED WALL, FLOOR AND CEILING FINISHES. INSTALL OVER ADJACENT CONSTRUCTION AND TRIM TO FINISH AT BUILDING WALL INTERSECTIONS.

GENERAL NOTES

1) FOR SPECIFIC FINISH LOCATIONS, PATTERNS AND EXTENTS - REFER TO THE FLOOR PLANS, REFLECTED CEILING PLANS AND INTERIOR ELEVATIONS

2) REFER TO THE DIVISION 09 SPECIFICATIONS FOR DETAILED INFORMATION ABOUT FINISH MATERIALS AND INSTALLATION

3) WALL FINISHES INDICATED ARE TO BE INSTALLED OVER SIP PANELS, GYPSUM WALL BOARD OR CEMENT BOARD AS INDICATED
BY WALL ASSEMBLY TYPES AND IN THE SPECIFICATIONS

4) REFER TO SPEC SECTION 08710 FOR DOOR HARDWARE SETS

DOOR SCHEDULE

DOOR #	ROOM NAME	WIDTH LEAF 1	HEIGHT	DOOR FINISH	DOOR TYPE	FRAME TYPE	RATING	DETAILS HEAD	DETAILS JAMB	DETAILS SILL	NOTES
101	STORAGE	3' - 6"	7' - 0"		B	IM-1		6/A-502	6/A-502	7/A-502	(1)
101A	HALL	3' - 6"	7' - 0"		B	IM-1					(1)
101B	STORAGE OVERHEAD	8' - 0"	7' - 0"		D	IM-1					(1)
102	OFFICE	3' - 0"	7' - 0"		B	HM-1					(1)
103	ELEC	3' - 0"	7' - 0"		A	HM-1	-				(1)
104	TOILET	3' - 0"	7' - 0"		A	HM-1	-				(1)
105	MECH	3' - 0"	7' - 0"		A	HM-1	-				(1)
201	STORAGE	3' - 6"	7' - 0"		A	HM-1		6/A-502	6/A-502	7/A-502	(1)

DOOR SCHEDULE ABBREVIATIONS

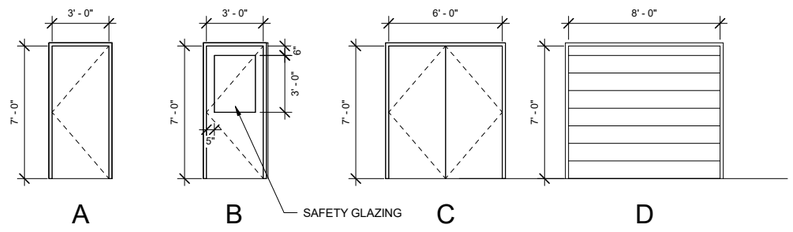
(1)	NOTE; REFER TO DOOR SCHEDULE NOTES ON THIS SHEET
ST	STEEL DOOR; REFER TO SPEC SECTION 08110
N	NONE/NOT APPLICABLE
HM	HOLLOW METAL
IM	INSULATED METAL

DOOR SCHEDULE NOTES

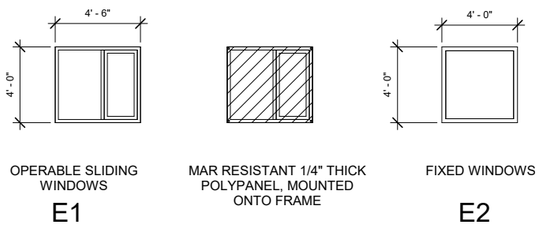
(1) REFER TO SPEC SECTION 08710 FOR DOOR HARDWARE SETS

DOOR TYPE ELEVATIONS

REFER TO DOOR AND FRAME SCHEDULE FOR MATERIAL AND DETAILS



WINDOW TYPE ELEVATIONS



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SCHEDULES

SHEET NO:

A-601

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STRUCTURAL NOTES:

THE FOLLOWING NOTES APPLY UNLESS INDICATED OTHERWISE:

CODES AND STANDARDS

ALL CONSTRUCTION MATERIALS AND WORKMANSHIP SHALL CONFORM TO THE REQUIREMENTS OF THESE DRAWINGS, INTERNATIONAL BUILDING CODE (IBC) 2021 EDITION AND ASCE 7-16 "MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES", AS ADOPTED BY THE STATE OF ALASKA.

DESIGN LOADS

RISK CATEGORY II

DEAD LOAD

SELF-WEIGHT + 5 PSF COLLATERAL AT ROOF	
FREEZER	20 PSF

LIVE LOAD

FLOOR	50 PSF + 15 PSF PARTITION
STORAGE (INCLUDING CORRAL SHED)	125 PSF
FREEZER (STORAGE)	125 PSF
MECHANICAL / ELECTRICAL	125 PSF
MODULES (LIGHT MANUF.)	125 PSF

SNOW LOAD

GROUND SNOW LOAD	Pg = 95 PSF
IMPORTANCE FACTOR	Is = 1.0
EXPOSURE FACTOR	Ce = 0.7
THERMAL FACTOR	Ct = 1.0
MIN FLAT-ROOF SNOW LOAD	Pf = 47 PSF
SNOW DRIFT	PER ASCE 7-16
UNBALANCED SNOW LOAD	PER ASCE 7-16

WIND

BASIC WIND SPEED	V = 160 MPH
EXPOSURE CATEGORY	EXSPOSURE D
IMPORTANCE FACTOR	Iw = 1.0
TOPOGRAPHIC FACTOR	Kzt = 1.0
DIRECTIONALITY FACTOR	Kd = 0.85
GROUND ELEVATION FACTOR	Ke = 1.0
GUST FACTOR	G = 0.85
ENCLOSURE CLASSIFICATION	ENCLOSED

SEISMIC

SPECTRAL ACCEL., SHORT	Ss = 0.19
SPECTRAL ACCEL., 1.0 SEC	S1 = 0.074
DESIGN SPECTRAL ACCEL., SHORT	Sds = 0.202
DESIGN SPECTRAL ACCEL., 1.0 SEC	Sd1 = 0.118
IMPORTANCE FACTOR	Ie = 1.0
SITE CLASS	D
SEISMIC DESIGN CATEGORY	B

SUPPORT BUILDING AND STORAGE SHED: LIGHT-FRAME WALLS SHEATHED WITH WOOD STRUCTURAL PANELS RATED FOR SHEAR RESISTANCE

RESPONSE MOD FACTOR	R = 6.5
SYSTEM OVERSTRENGTH	Ω = 3
BASE SHEAR	V = 0.031W

GENERAL

REFERENCE STANDARDS:

REFER TO CHAPTER 35 OF THE IBC. WHERE OTHER STANDARDS ARE NOTED IN THE DRAWINGS, USE THE EDITION ADOPTED BY THE 2021 IBC. REFERENCE TO A SPECIFIC SECTION IN A CODE DOES NOT RELIEVE THE CONTRACTOR FROM COMPLIANCE WITH THE ENTIRE STANDARD.

DEFINITIONS:

"STRUCTURAL ENGINEER OF RECORD" (SER) - THE STRUCTURAL ENGINEER WHO IS LICENSED TO STAMP & SIGN THE STRUCTURAL DOCUMENTS FOR THE PROJECT. THE SER IS RESPONSIBLE FOR THE DESIGN OF THE PRIMARY STRUCTURAL SYSTEM.

"SUBMIT FOR REVIEW" - SUBMIT TO THE ENGINEER FOR REVIEW PRIOR TO FABRICATION OR CONSTRUCTION.

"PER PLAN" - INDICATES REFERENCES TO THE STRUCTURAL PLANS, ELEVATIONS AND STRUCTURAL GENERAL NOTES.

"ENCLOSED" - IN REFERENCE TO ENCLOSURE CLASSIFICATION FOR WIND LOADS. "ENCLOSED" MEANS THAT ELEMENTS, COMPONENTS, AND SUB-SYSTEMS SERVING TO CLOSE WHAT WOULD OTHERWISE BE OPENINGS IN THE BUILDING EXTERIOR. EXTERIOR ENVELOPE SHALL BE DESIGNED TO WITHSTAND THE APPLICABLE COMPONENT & CLADDING WIND LOADS PER ASCE 7.

SITE VERIFICATION:

THESE DRAWINGS INDICATE GENERAL AND TYPICAL DETAILS OF CONSTRUCTION. WHERE CONDITIONS ARE NOT SPECIFICALLY SHOWN, SIMILAR DETAILS OF CONSTRUCTION SHALL BE USED, SUBJECT TO THE REVIEW AND APPROVAL OF THE OWNER'S REPRESENTATIVE.

THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND CONDITIONS AT THE SITE. CONFLICTS BETWEEN THE DRAWINGS AND ACTUAL SITE CONDITION SHALL BE BROUGHT TO THE ATTENTION OF THE OWNER'S REPRESENTATIVE BEFORE PROCEEDING WITH THE WORK.

GENERAL CONTRACTOR NOTES:

THE GENERAL CONTRACTOR SHALL NOTIFY THE OWNER'S REPRESENTATIVE IN WRITING OF ANY DISCREPANCIES BETWEEN EXISTING CONDITIONS AND WHAT IS SHOWN IN THE CONTRACT DOCUMENTS WHICH WILL ADVERSELY AFFECT THE WORK.

THE CONTRACTOR SHALL PROVIDE TEMPORARY BRACING AND SHORING REQUIRED FOR INSTALLATION OF ALL COMPONENTS OF THE CONTRACT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL SAFETY PRECAUTIONS AND THE METHODS, TECHNIQUES, AND SEQUENCES OF PROCEDURES REQUIRED TO PERFORM THE WORK. THE CONTRACTOR SHALL COORDINATE ALL TRADES AND VERIFY DIMENSIONS IN THE FIELD.

STRUCTURAL STEEL

MATERIALS:

ALL STRUCTURAL STEEL SHALL CONFORM TO AISC AND ASTM SPECIFICATIONS AS FOLLOWS:

WIDE FLANGE (W), TEE (WT) SHAPES	ASTM A992, FY = 50 KSI
ANGLES, CHANNELS & RODS	ASTM A36, FY = 36 KSI
PLATES (PL)	ASTM A529 OR A572, FY = 50 KSI
PIPE	ASTM A53, GRADE B, FY = 35 KSI
HIGH STRENGTH BOLTS	ASTM F3125 GRADE A325
HARDENED CIRCULAR WASHERS	ASTM F436
HIGH STRENGTH HEAVY HEX NUTS	ASTM A194 OR A563

FABRICATION AND ERECTION SHALL BE IN ACCORDANCE WITH AISC SPECIFICATIONS.

STRUCTURAL STEEL, MISCELLANEOUS STEEL, METAL FABRICATIONS, AND STEEL FASTENERS SHALL BE HOT DIP GALVANIZED IN ACCORDANCE WITH ASTM A123 OR A153 AS APPLICABLE.

PLANK GRATING:

PLANK GRATING WALKWAY, 13 GAGE, GALVANIZED G90 FINISH, MINIMUM 30% OPEN AREA, 1-1/2" OVERALL THICKNESS BY MCNICHOLS OR APPROVED EQUAL. PLANK TO BE INSTALLED THE LONG DIRECTION RUNNING PERPENDICULAR TO SUPPORTS WITH MANUFACTURER'S STANDARD FASTENING SYSTEM.

STRUCTURAL STEEL WELDING:

ALL STRUCTURAL WELDING SHALL BE PRE-QUALIFIED AND CONFORM TO AISC AND AWS SPECIFICATIONS AS FOLLOWS:

WELDERS	CERTIFIED FOR ROD AND POSITION
ELECTRODES	SMAW-E70XX; HEAVY COATED; LOW HYDROGEN
	FCAW-E70XX; LOW HYDROGEN
MINIMUM WELD	CONT. FILLET PER AISC TABLE J2.4

ALL WELDING SHALL BE PERFORMED BY AWS CERTIFIED WELDERS HAVING CURRENT CERTIFICATES AND EXPERIENCE IN THE TYPE OF WELD BEING PERFORMED. WELDING CERTIFICATES SHALL BE THOSE ISSUED BY AN ACCEPTED TEST AGENCY. ALL WELDING SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF AWS D1.1. USE E70 SERIES LOW HYDROGEN ELECTRODES STORED AND MAINTAINED IN DRY CONDITION PER AWS.

STRUCTURAL TIMBER AND SHEATHING

STRUCTURAL SAWN LUMBER:

VISUALLY GRADED LUMBER AND STAMPED PER WWPA STANDARD GRADING RULES. MOISTURE CONTENT 19% MAXIMUM FOR LUMBER 2" OR LESS IN THICKNESS.

DOUGLAS FIR/LARCH GRADE NUMBER 1 OR BETTER. MINIMUM NAILING FOR CONNECTION OF VARIOUS COMPONENTS PER IBC TABLE 2304.10.2. USE MILD STEEL PLATE WASHERS AT ALL BOLT HEADS AND NUTS BEARING ON WOOD. USE GALVANIZED FRAMING HARDWARE BY SIMPSON, USP, OR APPROVED EQUAL. USE COMMON NAILS ONLY. ICC CERTIFICATION REQUIRED. ALL FASTENERS AND CONNECTORS IN CONTACT WITH PRESSURE TREATED WOOD SHALL BE HOT DIP GALVANIZED OR EQUAL.

MINIMUM NAIL SIZE: 8d COMMON - 0.131"Ø x 2 1/2"
10d COMMON - 0.148"Ø x 3"
16d COMMON - 0.162"Ø x 3 1/2"

GLUE-LAMINATED TIMBER:

DOUGLAS FIR/LARCH SPECIES, COMBINATION 24F-V8, TYPICAL. Fb = 2,400 PSI, Fv = 265 PSI, Fc (PERPENDICULAR) = 650 PSI, AND E = 1,800,000 PSI. MOISTURE CONTENT 19% MAXIMUM. USE MILD STEEL PLATE WASHERS AT ALL BOLT HEADS AND NUTS BEARING ON WOOD.

ALL BEAMS SHALL BE FABRICATED USING WET-USE ADHESIVES. FABRICATION AND HANDLING PER THE LATEST AITC AND WWPA STANDARDS. BEAMS SHALL BEAR GRADE STAMP AN AITC STAMP AND CERTIFICATE. MINIMUM INDUSTRIAL GRADE APPEARANCE CLASSIFICATION. FOUNDATION AND FLOOR BEAMS SHALL BE TREATED WITH PRESERVATIVE FOR USE CATEGORY UC4B IN ACCORDANCE WITH AWPA U1. SUBMIT SHOP DRAWINGS.

WOOD SHEATHING:

FLOOR SHEATHING - 1 1/8" T&G APA RATED PLYWOOD, EXPOSURE 1, 48/24 SPAN RATING.

ROOF SHEATHING - 3/4" T&G APA RATE PLYWOOD, EXPOSURE 1, 48/24 SPAN RATING.

THE LONG DIMENSION OF PLYWOOD SHALL BE LAID ACROSS SUPPORTS. PLYWOOD SHEETS SHALL BEAR GRADE STAMP. BLOCK ALL PLYWOOD EDGES. GLUE FLOOR SHEATHING TO ALL SUPPORTS WITH ADHESIVE COMPLYING WTH APA AFG-01 AT A 50% SKIP PATTERN AND A 3/16" DIAMETER BEAD MINIMUM.

NAILING PATTERNS AS FOLLOWS:

ROOF SHEATHING - 10d RING SHANK OR SPIRAL THREADED NAILS @ 6" O.C. AT PANEL EDGES AND 12" O.C. IN THE FIELD. TIGHTEN SPACING TO 4" O.C. AT DIAPHRAGM BOUNDARIES (I.E. RIM BOARDS, LEDGERS, EXTERIOR WALLS, SHEAR WALLS). ALSO TIGHTEN SPACING TO 4" O.C IN THE FIELD FOR PANELS THAT ARE LOCATED WITHIN THE "EDGE ZONE" PER THE ROOF WIND UPLIFT PLAN ON S-103.

FLOOR SHEATHING - 10d RING SHANK @ 6" O.C. AT PANEL EDGES AND IN THE FIELD

STRUCTURAL INSULATED PANELS (SIPS):

FACTORY ASSEMBLED WALL, FLOOR, AND ROOF PANELS CONSISTING OF ORIENTED STRAND BOARD OR PLYWOOD FACINGS WITH EXPANDED POLYSTYRENE OR GRAPHITE POLYSTYRENE CORES. PANEL FACINGS TO COMPLY WITH APA STANDARDS AND SHEATHING THICKNESS NOTED FOR PLYWOOD. STRUCTURAL BOND REQUIRED BETWEEN FACINGS AND CORE.

SIP PANEL SPLINES SHALL BE STRUCTURAL REINFORCED SPLINES CONTAINING DISCRETE REINFORCING TIMBER OR LUMBER ELEMENT(S) EACH SIDE OF JOINT, CONTINUOUS FOR THE FULL LENGTH/HEIGHT OF THE PANEL, UNLESS NOTED OTHERWISE. SIP SUPPLIER IS RESPONSIBLE FOR DESIGN OF HEADERS, SPLINES, AND FASTENER PATTERNS. SUBMIT SHOP DRAWINGS FOR REVIEW. PREMIER BUILDING SYSTEMS, LLC SIPS ARE BASIS OF DESIGN.

SUPPORT BUILDING MINIMUM ALLOWABLE SHEAR CAPACITY AS FOLLOWS:

WALL ON GRID B = 475 PLF
WALLS ON GRID C & H = 310 PLF
ALL OTHER WALLS = 250 PLF

CORRAL STORAGE SHED MINIMUM ALLOWABLE SHEAR CAPACITY AS FOLLOWS:

FLOOR = 250 PLF
ROOF = 250 PLF
WALLS = 250 PLF

MINIMUM ALLOWABLE SHEAR CAPACITIES ARE CALCULATED FOR ALLOWABLE STRESS DESIGN (ASD) WIND LOADING IN ACCORDANCE WITH ASCE 7.

SIP PANELS SHALL CONTAIN PRE-CUT ELECTRICAL CHASES COORDINATED WITH THE ELECTRICAL DRAWINGS. BOTH FACINGS OF SIP WALL PANELS SHALL BEAR ON SUPPORTING FOUNDATION OR STRUCTURE, UNLESS INDICATED OTHERWISE IN THE DRAWINGS.

SIP FLOOR SHALL BE MINIMUM 8 FOOT LONG, TWO-SPAN CONTINUOUS. NO SINGLE SPAN CONDITION IS ALLOWED.

INSTALLATION SHALL BE ACCORDING TO MANUFACTURER'S INSTRUCTIONS. ICC CERTIFICATION REQUIRED. SUBMIT SHOP DRAWINGS INDICATING PANEL TYPE(S), PANEL MARKS, PANEL LAYOUT, DIMENSIONS, OPENING LOCATIONS, HOLD-DOWN ACCESS LOCATIONS (FOR SHOP AND/OR FIELD CREATION), ADDED STRUCTURAL MEMBERS PER THE STRUCTURAL DRAWINGS, AND MANUFACTURER'S REQUIRED INSTALLATION NOTES AND DETAILS.

PREFABRICATED TIMBER JOISTS:

JOISTS DESIGNED AND MANUFACTURED BY REDBUILT OR APPROVED EQUAL. ICC CERTIFICATION REQUIRED.

JOIST DESIGNATIONS ARE PER REDBUILT STANDARDS. COORDINATE WEIGHTS, LOCATIONS, AND SUPPORT DETAILS. PROVIDE STANDARD JOIST CAMBER. PROVIDE BRIDGING AND ERECTION BRACING PER MANUFACTURER'S INSTRUCTIONS.

PRE-ENGINEERED WOOD TRUSSES:

WOOD TRUSSES DESIGN, MANUFACTURED, AND INSTALLED PER TRUSS PLATE INSTITUTE SPECIFICATIONS. ICC CERTIFICATION REQUIRED.

MINIMUM CHORD SIZE SHALL BE 2X6. MINIMUM WEB SIZE SHALL BE 2X4. TRUSSES SHALL BE DESIGNED FOR UNIFORM LOADS AS INDICATED IN THE DRAWINGS. BOTTOM CHORD SHALL BE DESIGNED TO CARRY MINIMUM 10 PSF DEAD LOAD. COORDINATE WEIGHTS, LOCATIONS AND SUPPORT DETAILS.

SUBMIT SHOP DRAWINGS SHOWING TRUSSES AND ERECTION BRACING SIZES AND CONNECTIONS. SHOP DRAWINGS AND DESIGN CALCULATIONS BOTH STAMPED BY A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF ALASKA. PROVIDE STANDARD TRUSS CAMBER. PROVIDE ERECTION BRACING PER MANUFACTURER'S INSTRUCTIONS AND PERMANENT BRACING AS INDICATED ON THE PLANS.

SOILS AND FOUNDATIONS:

FOUNDATION DESIGN IS BASED ON RECOMMENDATIONS FROM THE DRAFT GEOTECHNICAL MEMORANDUM PREPARED BY WSP DATED JULY 23, 2023.

MICORPILES:

PILES SHALL BE INSTALLED IN AUGURED HOLES. PILES SHALL BE LENGTH AND DIAMETER AS INDICATED ON THE DRAWINGS. INSTALLATION TOLERANCE TO WITHIN 1" OF LINE AND GRID AS SHOWN ON THE DRAWINGS. THE TOP HALF OF THE PILES SHALL BE HOT-DIP GALVANIZED.

GROUT:

GROUT SHALL BE MINIMUM 5000 PSI MINIMUM, 7-DAY CUBE STRENGTH PER ASTM C109. GROUT TO BE PRE-MIXED, NON-METALLIC, NON-SHRINK. ICC CERTIFICATION REQUIRED. USE SPECIFIC GROUT MIX RECOMMENDED BY MANUFACTURER FOR EACH GROUT APPLICATION AND FOLLOW MANUFACTURER'S INSTRUCTIONS.

SUBMITTALS

THE FOLLOWING ARE TO BE SUBMITTED FOR REVIEW PRIOR TO FABRICATION:

WELDER QUALIFICATIONS AND WELD PROCEDURES
STRUCTURAL TIMBER AND SHEATHING PRODUCT DATA
GLUE-LAMINATED BEAM SHOP DRAWINGS AND PRODUCT DATA

DEFERRED SUBMITTALS

THE FOLLOWING ITEMS ARE TO BE DETAILED BY THE CONTRACTOR USING THE SPECIFICATIONS AND BASIS OF DESIGN DETAILS IN THE CONSTRUCTION DRAWINGS.

STRUCTURAL INSULATED PANELS - SOFFIT, FLOOR, WALL, ROOF
METAL PLATE-CONNECTED WOOD TRUSSES
PREFABRICATED TIMBER JOISTS
PRE-ENGINEERED PROCESSING MODULES

SPECIAL INSPECTIONS

PILE INSTALLATION - CONTINUOUS, VISUAL
- CONFIRM MATERIALS
- CONFIRM DRILL DEPTH
- OBSERVE SLURRY PLACEMENT

WELDING - PERIODIC, VISUAL
- CONFIRM MATERIALS
- VERIFY WELD LEG SIZE AND LENGTH

FLOOR SHEATHING - PERIODIC, VISUAL
- CONFIRM MATERIALS
- VERIFY FASTENERS AND SPACING

STRUCTURAL INSULATED PANELS - PERIODIC, VISUAL
- CONFIRM MATERIALS
- VERIFY FASTENERS AND SPACING

ABBREVIATIONS

AISC	AMERICAN INSTITUTE OF STEEL CONSTRUCTION
ARCH	ARCHITECT OR ARCHITECTURAL
ASCE	AMERICAN SOCIETY OF CIVIL ENGINEERS
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS
B.S.	BOTH SIDES
C.C	CENTER TO CENTER
℄	CENTER LINE
CONT	CONTINUOUS
DET	DETAIL
Ø	DIAMETER
DIM	DIMENSION
DWG	DRAWING(S)
(E)	EXISTING
EA	EACH
ELEV	ELEVATION
EXT	EXTERIOR
FDN	FOUNDATION
FT	FEET OR FOOT
GA	GAGE
GALV	GALVANIZED
GEN	GENERAL
GR	GRADE
IBC	INTERNATIONAL BUILDING CODE
K	KIP (1,000 POUNDS)
MAX	MAXIMUM
MFR	MANUFACTURER
MIN	MINIMUM
NTS	NOT TO SCALE
O.C.	ON CENTER
PL	PLATE
PT	PRESSURE TREATED
SIM	SIMILAR
SQ	SQUARE
STD	STANDARD
STIFF	STIFFENER
STL	STEEL
T.O.	TOP OF
T.O.S.	TOP OF STEEL
T.O.P.	TOP OF PILE
TYP	TYPICAL
UNO	UNLESS NOTED OTHERWISE
W/	WITH

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Dec 15, 2023
No. SE 13701
REGISTERED PROFESSIONAL ENGINEER

KAWERAK
KAWERAK, INC.

SAVOONGA REINDEER PROCESSING FACILITY

BID DOCUMENTS

REV	DATE	DESCRIPTION

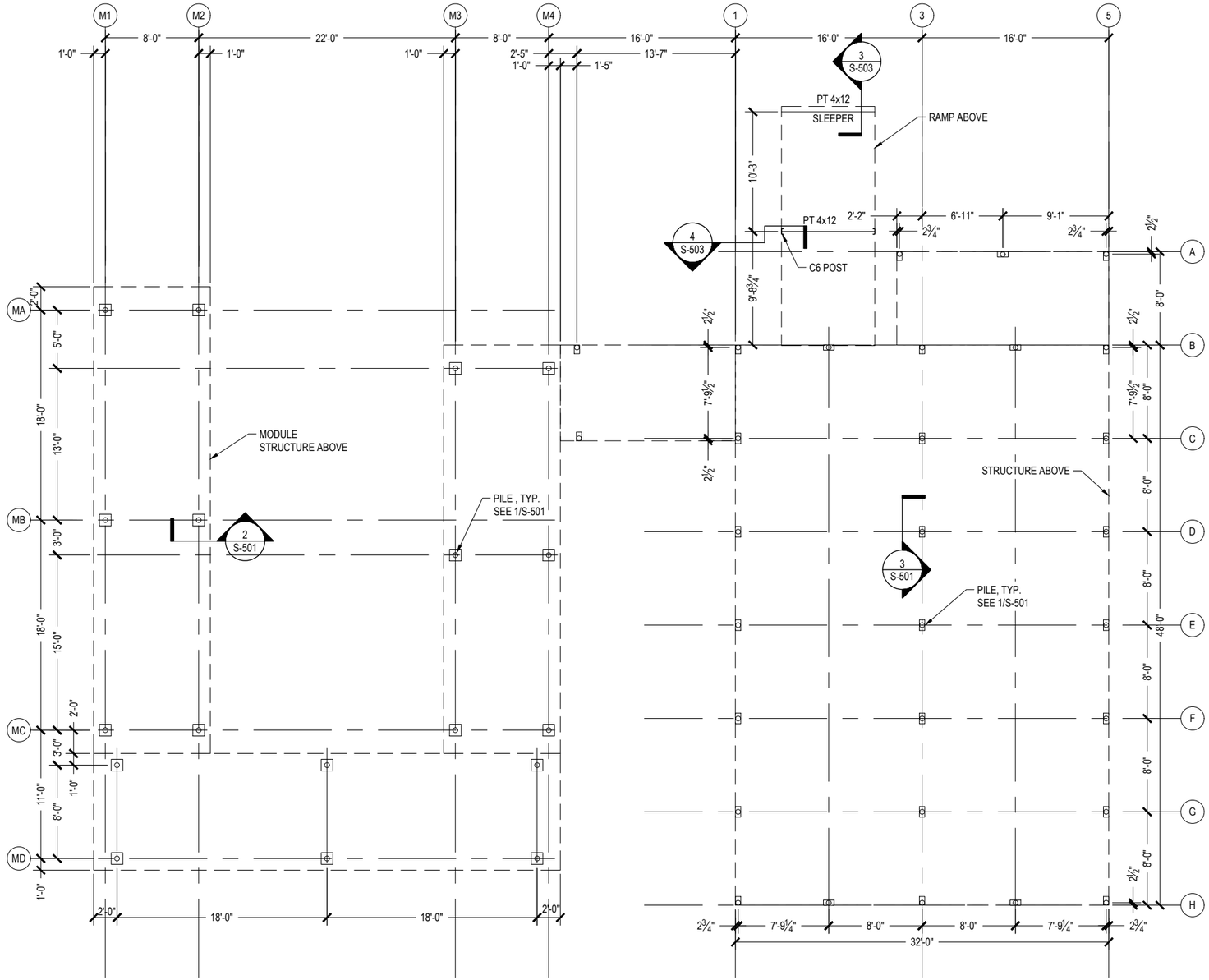
PROJ. NO.	231585
DRAWN	BMH
CHECKED	JAC
DATE	12/15/2023

SHEET TITLE:

GENERAL STRUCTURAL NOTES

SHEET NO:

S-001



1 S-101 MODULE AND SUPPORT BUILDING PILE PLAN

SCALE: 3/16" = 1'-0"

NORTH

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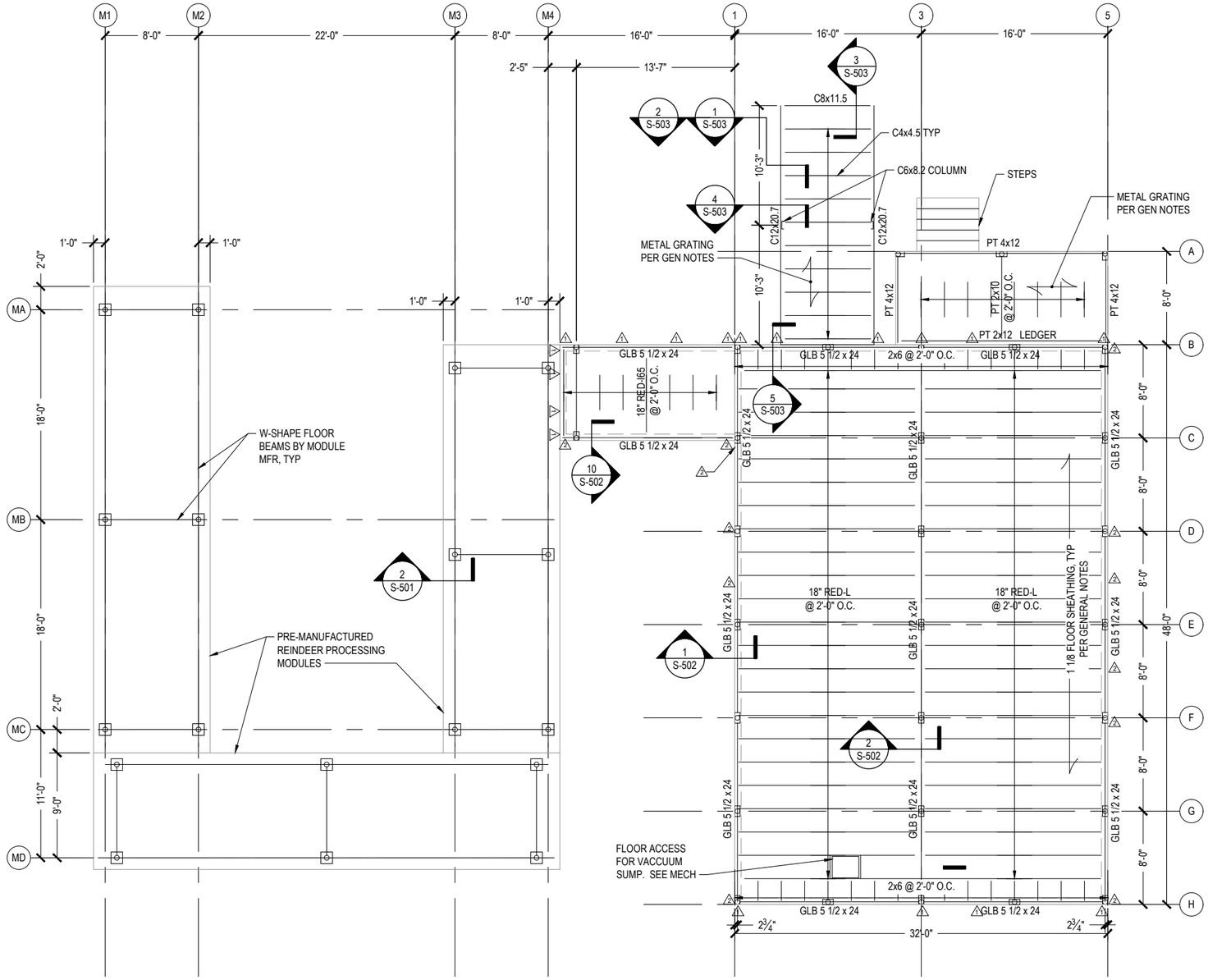
SHEET TITLE:

PILE PLAN

SHEET NO:

S-101



NORTH

1 S-101 MODULE AND SUPPORT BUILDING FLOOR FRAMING PLAN

SCALE: 3/16" = 1'-0"

LEGEND

⚠1 HOLD DOWN TYPE 1
SEE DETAIL 3/S-502

⚠2 HOLD DOWN TYPE 2
SEE DETAIL 4/S-502

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PROJ. NO.	231585
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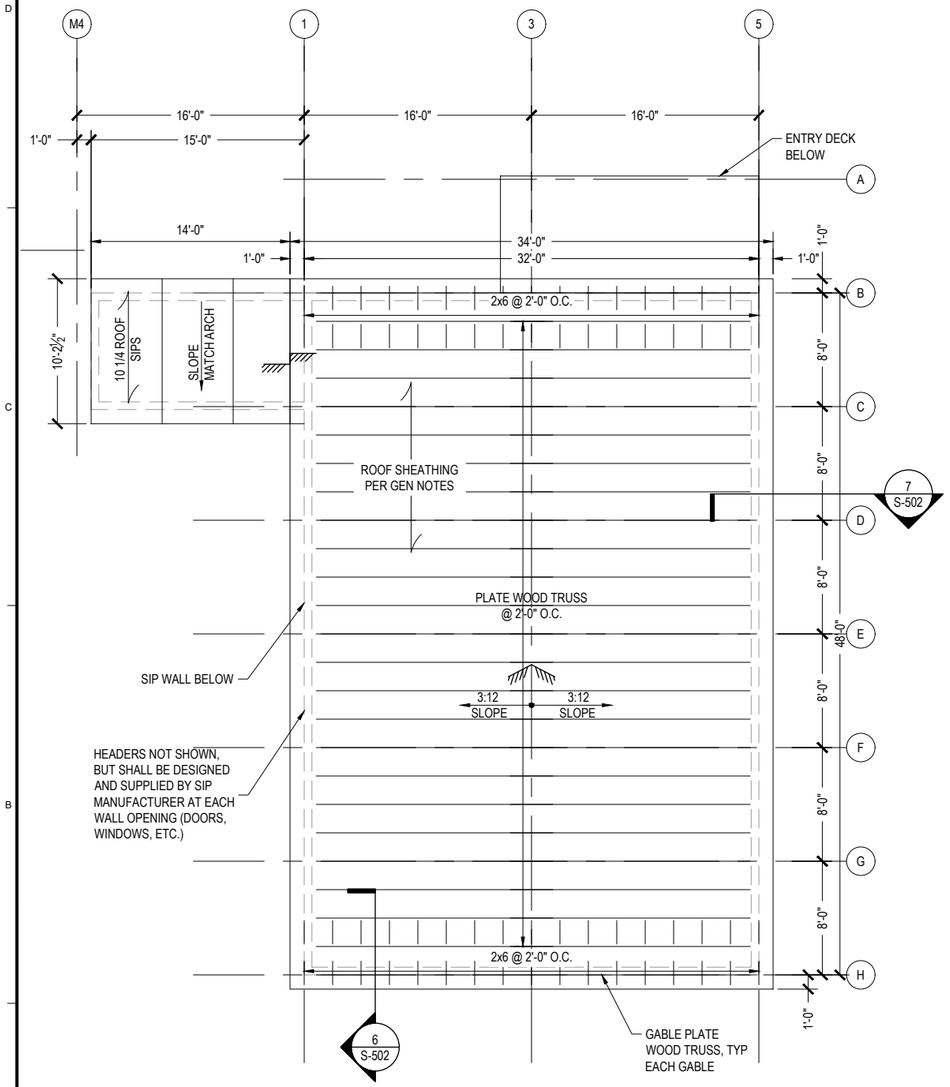
DATE	12/15/2023

SHEET TITLE:

FLOOR FRAMING
PLAN

SHEET NO:

S-102



1 S-101 SUPPORT BUILDING ROOF FRAMING PLAN
SCALE: 3/16" = 1'-0"

NORTH

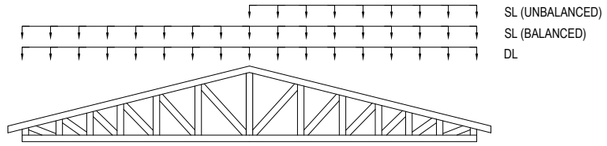
TRUSS LOADING NOTES:

1. DL = 20 PSF + SELF-WEIGHT OF TRUSS AND BLOCKING (SEE ALSO NOTE 7)
   LL = 20 PSF
   SL (BALANCED) = 43 PSF
   SL (UNBALANCED) = 30 PSF
2. UNBALANCED SNOW CAN OCCUR ON EITHER SIDE OF THE RIDGE AND IS ADDITIVE TO BALANCED SNOW LOAD.
3. SEE WIND LOAD MAP FOR C&C WIND PRESSURES ON TRUSSES.
4. MANUFACTURER SHALL SUPPLY BRIDGING NECESSARY FOR STABILITY AND UPLIFT.
5. TOTAL LOAD DEFLECTION LIMITED TO L/240.
6. SNOW LOADS INCLUDE IMPORTANCE FACTOR.
7. BOTTOM CHORD SHALL BE DESIGNED TO CARRY MINIMUM 10 PSF DEAD LOAD.

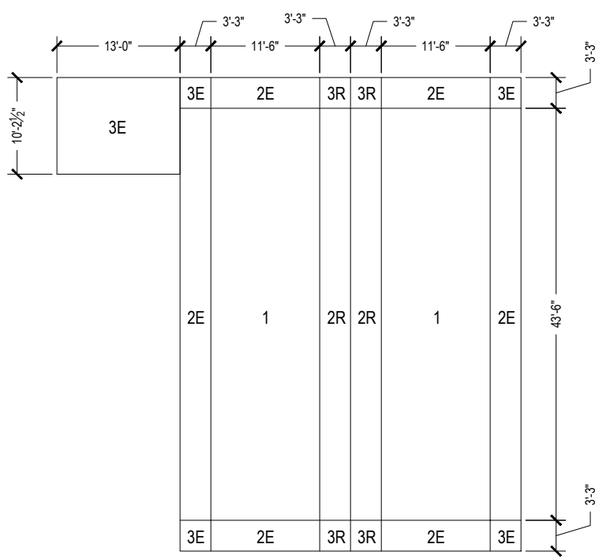
LEGEND

INDICATES CHANGE OF SLOPE

ROOF RIDGE



2 S-101 SUPPORT BUILDING ROOF TRUSS LOADING DIAGRAM
SCALE: 3/16" = 1'-0"



C&C WIND PRESSURES			
ZONE	COMPONENT EFFECTIVE AREA (SF)	MAX PRESSURE (PSF)	MIN PRESSURE (PSF)
1	<10	50.5	-125.1
	50	31.6	-76.3
2R	<10	50.5	-182.5
	50	31.6	-125.1
2E	<10	-190.5	-211.2
	50	-147.5	-168.2
3R	<10	-259.4	-280.1
	50	-163.0	-183.6
3E	<10	-225.0	-245.6
	50	-147.5	-168.2
4	<10	67.7	-73.5
	50	60.3	-66.6
	200	54.5	-60.3
5	<10	67.7	-90.7
	50	60.3	-76.3
	200	54.5	-64.3

NOTES:

1. NEGATIVE PRESSURES ARE TAKEN AS SUCTION ACTING AWAY FROM COMPONENT SURFACES.
2. ALL WALLS SHALL BE TAKEN AS ZONE 4 EXCEPT WITHIN A DISTANCE OF 3'-3" FROM BUILDING CORNERS, WHICH SHALL BE TAKEN AS ZONE 5.
3. WIND PRESSURES PROVIDED IN THE TABLE ARE STRENGTH DESIGN (SD) PRESSURES CALCULATED IN ACCORDANCE WITH ASCE 7.
4. LINEAR INTERPOLATION FOR INTERMEDIATE VALUES OF EFFECTIVE AREA IS PERMITTED.
5. WIND PRESSURES CAN BE ADJUSTED TO ALLOWABLE STRESS DESIGN (ASD) VALUES BY MULTIPLYING BY 0.60.

3 S-101 SUPPORT BUILDING WIND LOAD MAP
SCALE: 1/8" = 1'-0"

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BID DOCUMENTS

REV	DATE	DESCRIPTION

PROJ. NO.	231585
DRAWN	RJP
CHECKED	JAC
DATE	12/15/2023

SHEET TITLE:

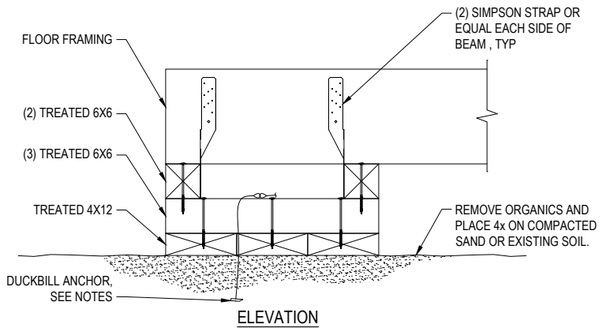
SUPPORT BUILDING ROOF FRAMING PLAN

SHEET NO:

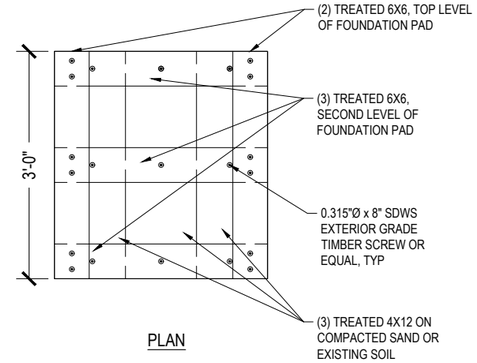
S-103

NOTES:

1. SECURE CRIBBING FOUNDATION AT SECOND LEVEL WITH GALVANIZED STRANDED-CABLE AND (2) 68-DB1 DUCKBILL ANCHORS AT EACH EXTERIOR FOUNDATION PAD, TYPICAL OF (8) LOCATIONS.
2. CABLE STRENGTH SHALL BE GREATER THAN OR EQUAL TO THAT OF THE DUCKBILL ANCHORS.
3. CONTRACTOR TO SUBMIT PRODUCT DATA FOR CABLES AND ANCHORS FOR REVIEW PRIOR TO INSTALLATION.
4. INSTALL DUCKBILL ANCHORS PER MANUFACTURER RECOMMENDATIONS. ANCHOR CABLES SHALL BE TAUGHT WITH MINIMAL SLACK.



ELEVATION

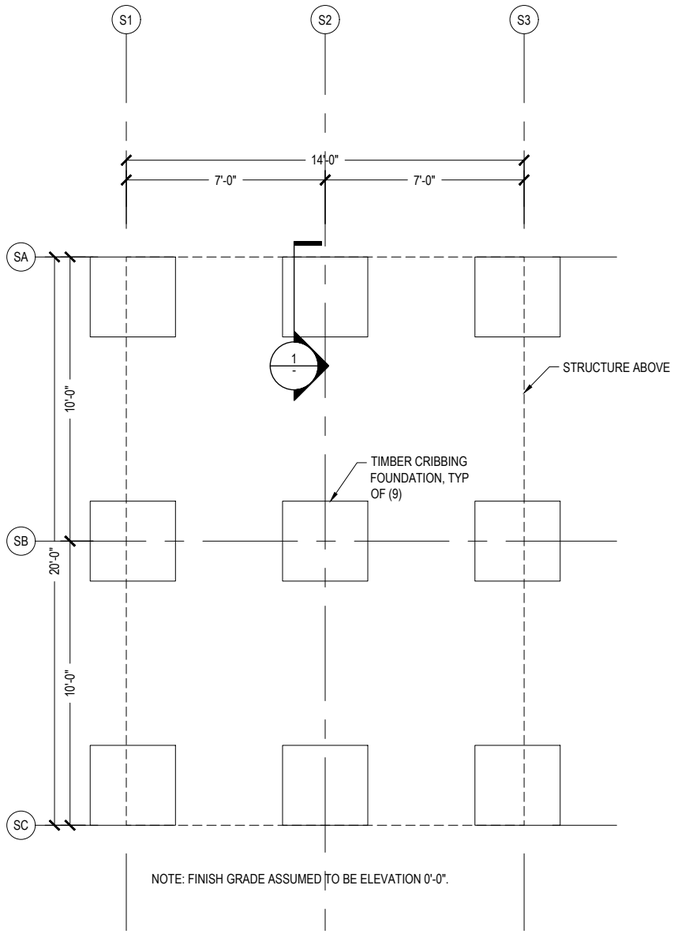


PLAN

NOTE: FLOOR FRAMING NOT SHOWN FOR CLARITY.

1 S-110 CORRAL STORAGE SHED CRIBBING FOUNDATION

SCALE: 1" = 1'-0"

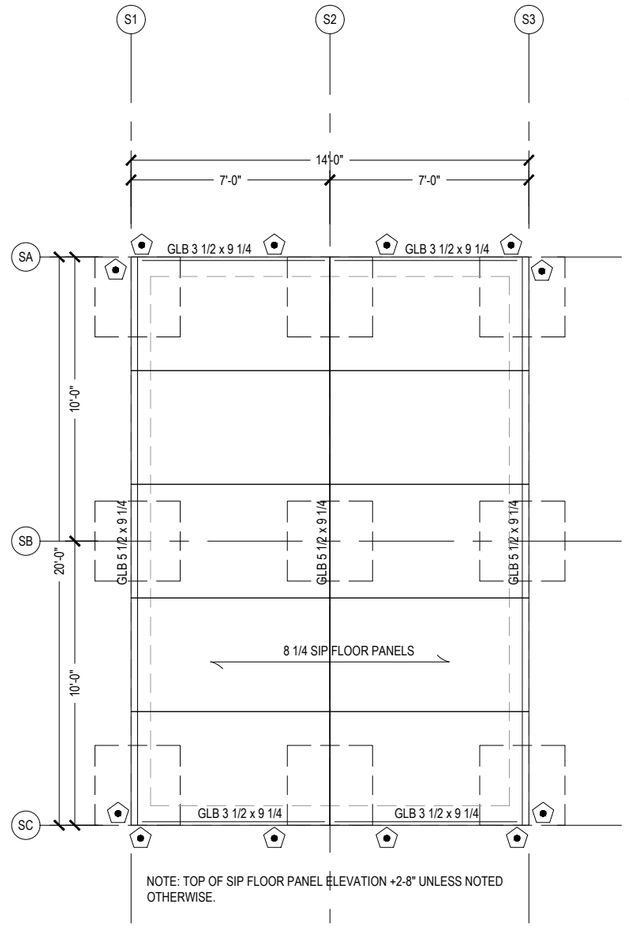


NOTE: FINISH GRADE ASSUMED TO BE ELEVATION 0'-0".

NORTH

2 S-110 CORRAL STORAGE SHED FOUNDATION PLAN

SCALE: 3/8" = 1'-0"



NOTE: TOP OF SIP FLOOR PANEL ELEVATION +2-8" UNLESS NOTED OTHERWISE.

NORTH

3 S-110 CORRAL STORAGE SHED FLOOR FRAMING PLAN

SCALE: 3/8" = 1'-0"

LEGEND

⬠ SIMPSON HDU4 - SDS EACH SIDE OF DOUBLE 2x DOOR / WINDOW JAMBS, EACH WITH (10) SDS ¼"Ø x 2 ½" SCREWS AND 5/8"Ø ALL-THREAD ROD THROUGH GLULAM BEAM WITH PL 1/4" x 3" SQ AND HEX NUTS. ALL-THREAD, PLATE AND NUTS SHALL BE HOT DIP GALVANIZED.

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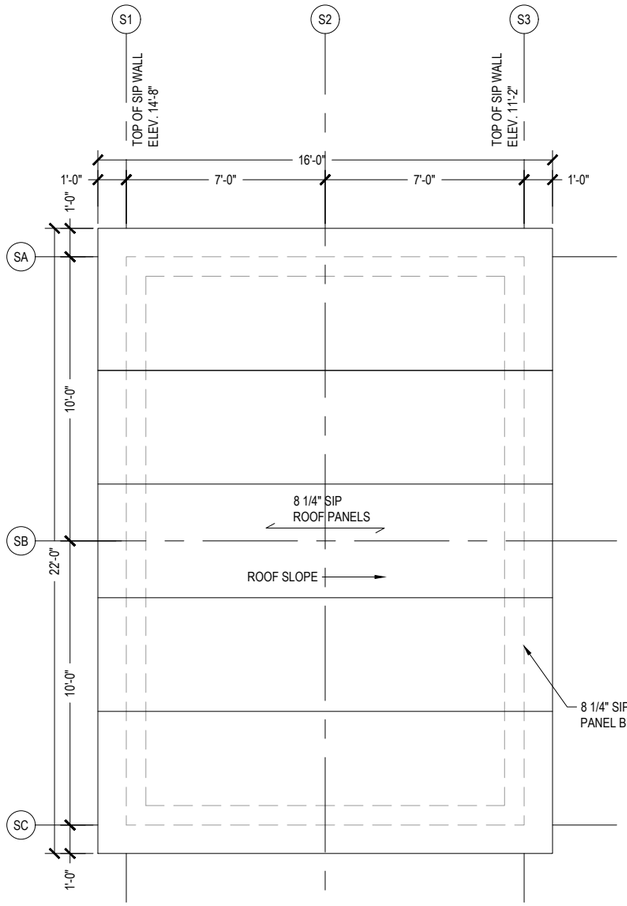
SHEET TITLE:

CORRAL STORAGE SHED FOUNDATION & FLOOR FRAMING PLAN

SHEET NO:

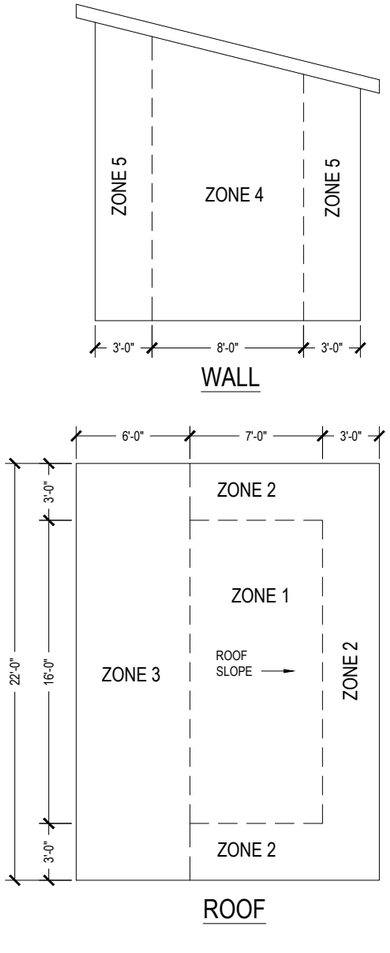
S-110



1 S-111 CORRAL STORAGE SHED ROOF FRAMING PLAN

SCALE: 3/8" = 1'-0"

NORTH



C&C WIND PRESSURES			
ZONE	EFFECTIVE COMPONENT AREA (SF)	MAX PRESSURE (PSF)	MIN PRESSURE (PSF)
1	< 10	33.3	-84.9
	100	27.6	-73.5
2	< 10	33.3	-102
	100	27.6	-79.2
3	< 10	33.3	-177
	100	27.6	-125
4	< 10	67.7	-73.5
	500	50.5	-56.2
5	< 10	67.7	-73.5
	500	50.5	-56.2

NOTES:

1. NEGATIVE PRESSURES ARE TAKEN AS SUCTION ACTING AWAY FROM COMPONENT SURFACES.
2. ALL WALLS SHALL BE TAKEN AS ZONE 4 EXCEPT WITHIN A DISTANCE OF 3'-0" FROM BUILDING CORNERS, WHICH SHALL BE TAKEN AS ZONE 5.
3. WIND PRESSURES PROVIDED IN THE TABLE ARE STRENGTH DESIGN (SD) PRESSURES CALCULATED IN ACCORDANCE WITH ASCE 7.
4. LINEAR INTERPOLATION FOR INTERMEDIATE VALUES OF EFFECTIVE AREA IS PERMITTED.
5. WIND PRESSURES CAN BE ADJUSTED TO ALLOWABLE STRESS DESIGN (ASD) VALUES BY MULTIPLYING BY 0.60.

2 S-111 CORRAL STORAGE WIND LOAD MAP

SCALE: 1/4" = 1'-0"

NORTH

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CHECKED	JAC
DATE	12/15/2023

SHEET TITLE:

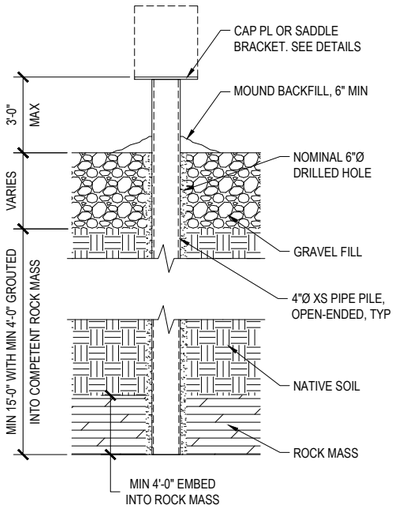
CORRAL STORAGE SHED ROOF FRAMING

SHEET NO:

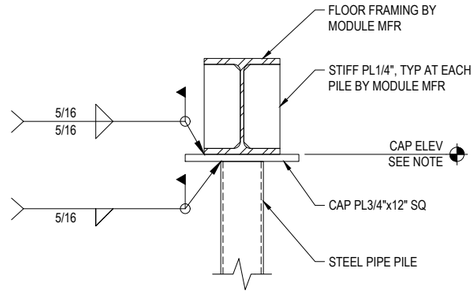
S-111

NOTES:

1. DRILL HOLE FULL DEPTH OF REQUIRED EMBEDMENT AS SHOWN.
2. DRILL HOLE SHALL BE NOMINAL 6" DIAMETER.
3. REMOVE LOOSE MATERIAL AND WATER FROM HOLE PRIOR TO PLACING PILE AND BACKFILLING. PROVIDE TEMPORARY CASING AS NECESSARY TO PREVENT SLOUGHING AND LOOSE MATERIAL INFILTRATION.
4. EMBED PILE MINIMUM 4'-0" INTO ROCK MASS. SEAT PILE ON ROCK AND TAP/DRIVE TO REFUSAL.
5. BACKFILL HOLE WITH CEMENT GROUT SLURRY. GROUT MAY BE PLACED PRIOR TO INSERTING THE PILE OR PUMPED TREMIE METHOD AFTER INSERTING THE PILE.
6. GROUT SHALL CURE MINIMUM 3 DAYS PRIOR TO LOADING THE PILES.

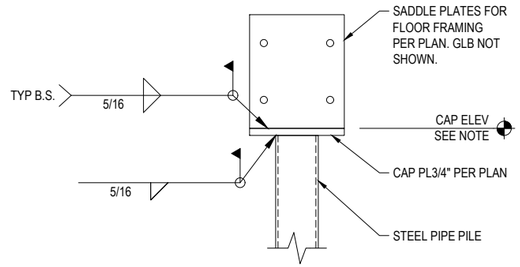


1 S-501 DRILLED PILE ELEVATION
SCALE: NTS



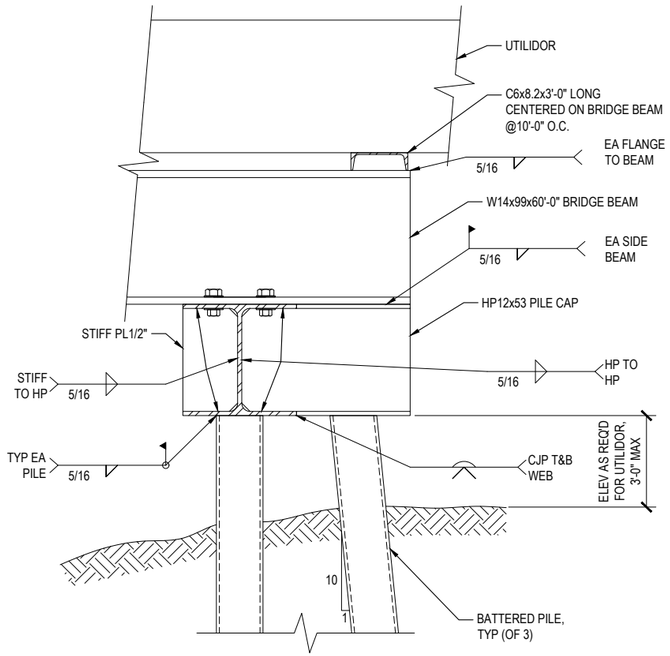
NOTE: COORDINATE WITH MODULE SUPPLIER. CAP ELEVATION AS REQUIRED TO ACHIEVE FINISHED FLOOR ELEVATION OF 4'-0" ABOVE FINISHED GRADE.

2 S-501 CAP PLATE AT PILE
SCALE: 1 1/2" = 1'-0"

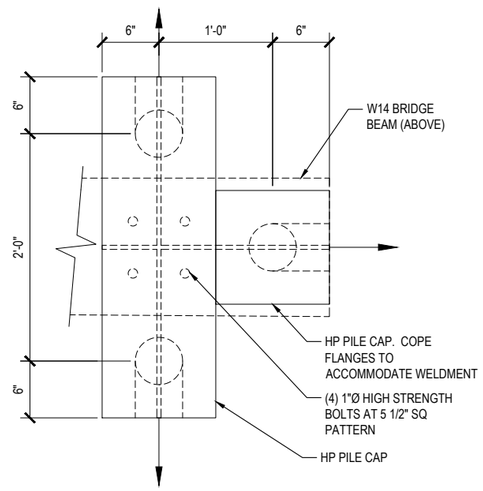


NOTE: CAP ELEVATION AS REQUIRED TO ACHIEVE FINISHED FLOOR ELEVATION OF 4'-0" ABOVE FINISHED GRADE.

3 S-501 SADDLE BRACKET AT PILE
SCALE: 1 1/2" = 1'-0"



PILE CAP SECTION



PILE CAP PLAN

NOTES:

1. SEE DETAIL 1/S-501 FOR PILE INSTALLATION NOTES.
2. USE DRILL CASING AS REQUIRED TO MAINTAIN INTEGRITY OF DRILL HOLES.
3. SEE CIVIL DRAWINGS FOR PILE LOCATIONS.

4 S-501 UTILITY BRIDGE FOUNDATION DETAILS
SCALE: 1-1/2" = 1'-0"

SHEET NOTES:

ALL FIELD WELDS SHALL BE GROUND SMOOTH, CLEANED, AND COATED WITH COLD GALVANIZING ZINC RICH PAINT.

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MATTHEW C. STIELSTRA
Dec 15, 2023
No. SE 13701
REGISTERED PROFESSIONAL ENGINEER

KAWERAK

KAWERAK, INC.

SAVOONGA REINDEER PROCESSING FACILITY

BID DOCUMENTS

REV	DATE	DESCRIPTION

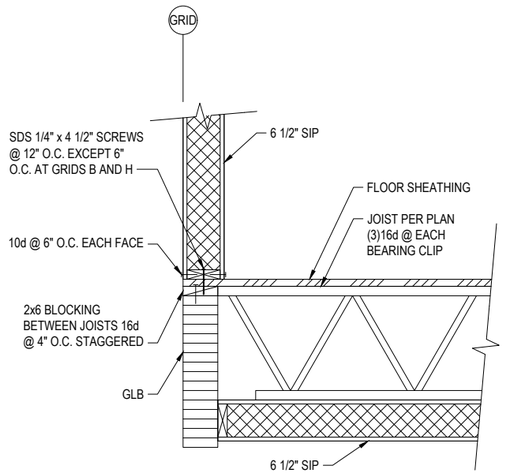
PROJ. NO.	231585
DRAWN	BMH
CHECKED	JAC
DATE	12/15/2023

SHEET TITLE:

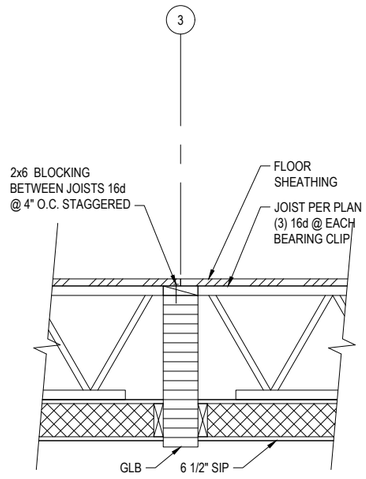
FOUNDATION DETAILS

SHEET NO:

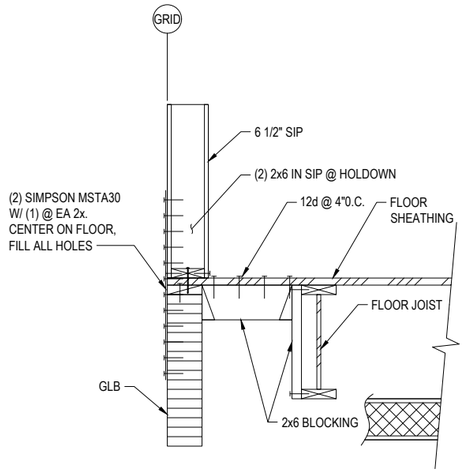
S-501



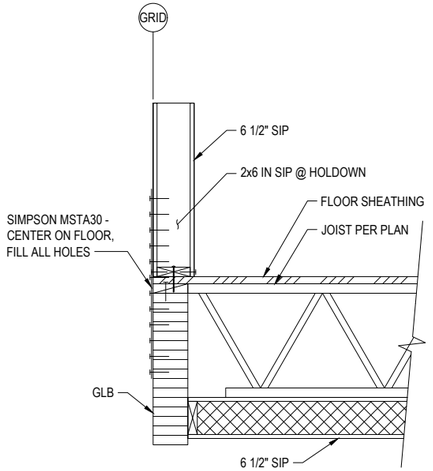
1 S-502 **JOIST AT EDGE BEAM**
SCALE: 1" = 1'-0"



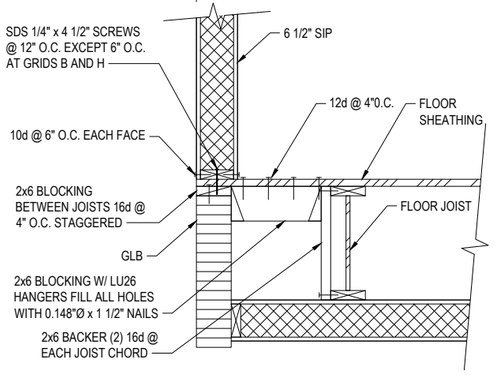
2 S-502 **JOIST AT GRID 3**
SCALE: 1" = 1'-0"



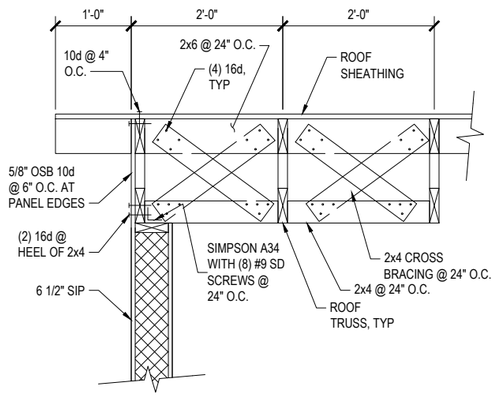
3 S-502 **HOLD DOWN - TYPE 1**
SCALE: 1" = 1'-0"



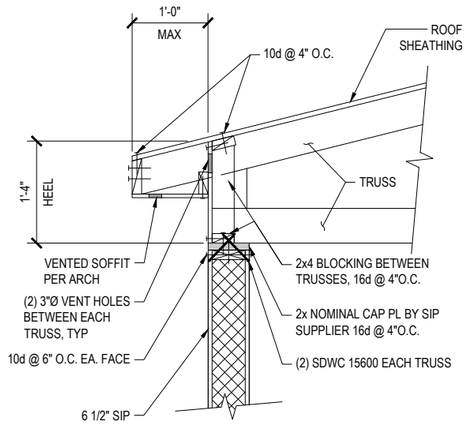
4 S-502 **HOLD DOWN - TYPE 2**
SCALE: 1" = 1'-0"



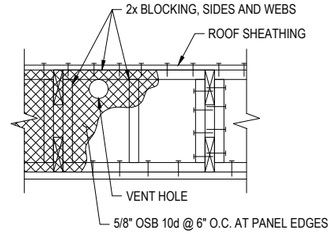
5 S-502 **SIP AT END WALL**
SCALE: 1" = 1'-0"



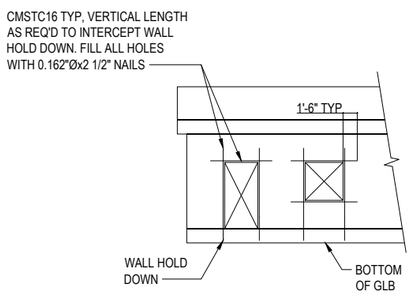
6 S-502 **GABLE WALL DETAIL**
SCALE: 1" = 1'-0"



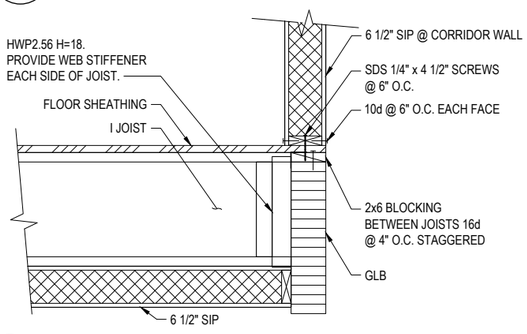
7 S-502 **TRUSS AT WALL SIP**
SCALE: 1" = 1'-0"



8 S-502 **TRUSS BLOCKING ELEVATION**
SCALE: 1" = 1'-0"



9 S-502 **STRAPS AT OPENINGS**
SCALE: NTS



10 S-502 **JOIST AT CORRIDOR**
SCALE: NTS

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BID DOCUMENTS

REV	DATE	DESCRIPTION

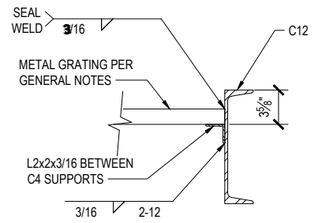
PROJ. NO.	231585
DRAWN	RJP
CHECKED	JAC
DATE	12/15/2023

SHEET TITLE:

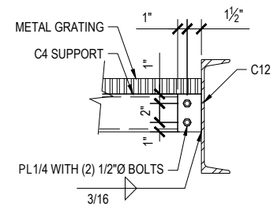
SUPPORT BUILDING FRAMING DETAILS

SHEET NO:

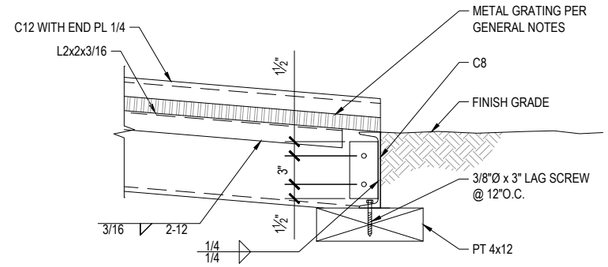
S-502



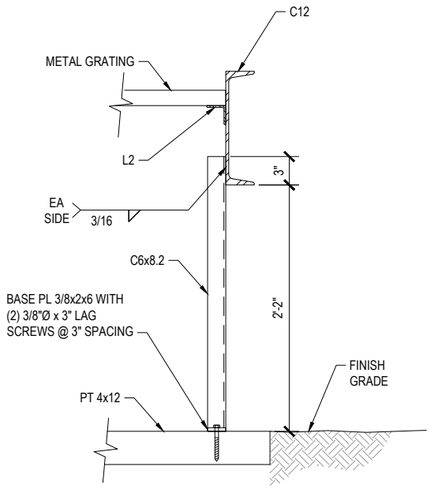
1 S-503 RAMP STRINGER
SCALE: 1 1/2" = 1'-0"



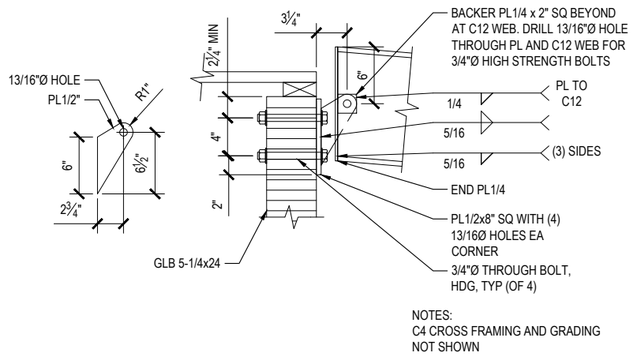
2 S-503 C4 SUPPORT TO C10 STRINGER
SCALE: 1 1/2" = 1'-0"



3 S-503 RAMP AT GRADE
SCALE: 1-1/2" = 1'-0"



4 S-503 RAMP VERTICAL SUPPORT
SCALE: 1 1/2" = 1'-0"



NOTES:
C4 CROSS FRAMING AND GRADING NOT SHOWN

5 S-503 RAMP TO GLB CONNECTION
SCALE: 1 1/2" = 1'-0"

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CHECKED	JAC
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SHEET TITLE:

SUPPORT BUILDING RAMP DETAILS

SHEET NO:

S-503

ABBREVIATIONS

ABBREV.	DESCRIPTION
ACH	AIR CHANGES PER HOUR
AHU	AIR HANDLING UNIT
AFF	ABOVE FINISHED FLOOR
BDD	BACKDRAFT DAMPER
BOD	BOTTOM OF DUCT
BOU	BOTTOM OF UNIT
BOS	BOTTOM OF STEEL
BTU	BRITISH THERMAL UNIT
BTUH	BTU'S PER HOUR
BPCS	BASIC PROCESS CONTROL SYSTEM
CFM	CUBIC FEET PER MINUTE
CONN	CONNECTOR
DIA	DIAMETER
DN	DOWN
EA	EXHAUST AIR
ELEV	ELEVATION
°F	DEGREE FAHRENHEIT
FD	FIRE DAMPER
F/G	FIBERGLASS
FLEX	FLEXIBLE
FPM	FEET PER MINUTE
F&G	FIRE & GAS
GA	GAUGE
GALV	GALVANIZED
GPM	GALLON PER MINUTE
HP	HORSEPOWER
HS	HAND SWITCH
HZ	FREQUENCY (HERTZ)
ID	INSIDE DIAMETER
IN. W.C.	INCHES WATER COLUMN
INSUL.	INSULATION
kW	KILOWATT
LB	POUND
LEL	LOWER EXPLOSIVE LIMIT
LG	LONG
MVD	MANUAL VOLUME DAMPER
MAX	MAXIMUM
MBH	BTUH (THOUSAND)
MFR	MANUFACTURER
MIN	MINIMUM
N/A	NOT APPLICABLE
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
NSW	NORTH SLOPE WORK
NTS	NOT TO SCALE
O/H	OVERHEAD
OSA	OUTSIDE AIR
OBD	OPPOSED BLADE DAMPER
OD	OUTSIDE DIAMETER
PH	PHASE (ELECTRICAL)
RLA	RELIEF AIR
RA	RETURN AIR
REQ'D	REQUIRED
RPM	REVOLUTIONS PER MINUTE
RTD	RESISTANCE TEMPERATURE DETECTOR
SA	SUPPLY AIR
SESD	SAFETY EMERGENCY SHUTDOWN
SCH	SCHEDULE
SHT	SHEET
SMACNA	SHEET METAL & AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION
SP	STATIC PRESSURE
SPEC	SPECIFICATION
SQ	SQUARE
TEMP	TEMPERATURE
THK	THICK
TOS	TOP OF STEEL
TSP	TOTAL STATIC PRESSURE
TYP	TYPICAL
V	VOLTS
VEL	VELOCITY
WC	WATER COLUMN
W/	WITH
WT	WEIGHT
XP	EXPLOSION PROOF

INSTRUMENT LEGEND

SYMBOL	DESCRIPTION
HS xxxx	HAND SWITCH
PDY xxxx	PRESSURE DIFFERENTIAL ACTUATOR
PDIT xxxx	PRESSURE DIFFERENTIAL INDICATING TRANSMITTER
TE xxxx	RTD TEMPERATURE ELEMENT
GDE xxxx	GAS DETECTING ELEMENT
GDT xxxx	GAS DETECTOR TRANSMITTER
IT xxxx	CURRENT TRANSMITTER
TY xxxx	TEMPERATURE DIFFERENTIAL ACTUATOR
UC xxxx	UNIT CONTROLLER

SCHEMATIC LEGEND

SYMBOL	DESCRIPTION
M	PARALLEL BLADE CONTROL DAMPER W/ ACTUATOR
M	OPPOSED BLADE CONTROL DAMPER W/ ACTUATOR
	FILTER
	CENTRIFUGAL FAN
	UNIT HEATER

MECHANICAL SYMBOL LEGEND

SYMBOL	ABBR.	DESCRIPTION	SYMBOL	ABBR.	DESCRIPTION
	W, C.I.S.P.	WASTE, CAST IRON SOIL PIPE			NEW DUCTWORK
	PW	PUMPED WASTE		S.L.	ACOUSTICALLY LINED DUCT
	V	VENT			THERMALLY INSULATED DUCT
	CW	COLD WATER	UP		DUCTWORK UP
	HW	HOT WATER	DN		DUCTWORK DOWN
	HWC	HOT WATER RECIRCULATION			TURNING VANES
HGR	HGR	HOT GLYCOL RETURN			AIR EXTRACTOR
HGS	HGS	HOT GLYCOL SUPPLY		S/A	SUPPLY AIR REG., GRILLE OR DIFFUSER
SMR	SMR	SNOW MELT RETURN		R/A	RETURN/EXHAUST AIR REG. OR GRILLE
SMS	SMS	SNOW MELT SUPPLY			SUPPLY
G	G	LOW PRESSURE GAS			RETURN OR EXHAUST
A	A	AIR PIPING			SUPPLY AIR SLOT WITH FLEX DUCT
		DEEP SEAL TRAP			RETURN AIR SLOT
		PIPE ELBOW DOWN			FLEXIBLE DUCT
		PIPE ELBOW UP			FLEXIBLE CONNECTION
		UNION	VD	VD, BD	VOLUME DAMPER
	GV/SOV	GATE VALVE/SHUT-OFF VALVE	FD	FD	FIRE DAMPER
		GLOBE VALVE	FSD	FSD	FIRE/SMOKE DAMPER
	MOV	MOTOR OPERATED VALVE 2-WAY	MOD	MOD	MOTOR OPERATED DAMPER
	MOV	MOTOR OPERATED VALVE 3-WAY	20 x 12		DUCT SIZE
	PRV	PRESSURE REDUCING VALVE		S/A	SUPPLY AIR
	CV	CHECK VALVE		R/A	RETURN / RELIEF AIR
		BALL VALVE (FULL PORT)		E/A	EXHAUST AIR
		STRAINER		O/A	OUTSIDE AIR
		THERMOMETER	DD	DD	DUCT DETECTOR
		PRESSURE GAGE W/ISOLATION VALVE	LVD		ACCESS PANEL
		FLEX CONNECTION	T T	T'STAT	THERMOSTAT,THERMOSTAT W/INS. BASE
Y	WHA	WATER HAMMER ARRESTER (Y=SIZE)		WCO	WALL CLEAN-OUT
	CO	CLEAN-OUT		FCO	FLOOR CLEAN-OUT
				FD	FLOOR DRAIN
					PIPE ANCHOR
					PIPE GUIDE
			# FT / MBH GPM		BASEBOARD IDENTIFICATION

MECHANICAL SCOPE OF WORK OVERVIEW:

THIS PROJECT INCLUDES THE DESIGN AND CONSTRUCTION OF A REINDEER MEAT PROCESSING FACILITY, SUPPORT BUILDING, AND REMOTE CORRAL SITE IN SAVOONGA, AK. THE MECHANICAL SCOPE OF WORK FOR THIS PROJECT INCLUDES THE COMPLETE HVAC AND PLUMBING SYSTEMS FOR THE SUPPORT BUILDING. THE DRAWINGS ARE DIAGRAMMATIC AND DO NOT NECESSARILY SHOW ALL FITTINGS, SUPPORTS, VENTS OR OTHER ITEMS THAT MAY BE REQUIRED FOR A COMPLETE AND FUNCTIONAL SYSTEM. COORDINATE WATER SERVICE, WATER RECIRCULATION AND VACUUM SANITARY SEWER CONNECTION WITH THE LOCAL UTILITY. OBTAIN THE UTILITY'S APPROVAL OF EQUIPMENT, MATERIALS AND INSTALLATION METHODS.

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KAWERAK
KAWERAK, INC.

SAVOONGA REINDEER PROCESSING FACILITY

BID DOCUMENTS

REV	DATE	DESCRIPTION

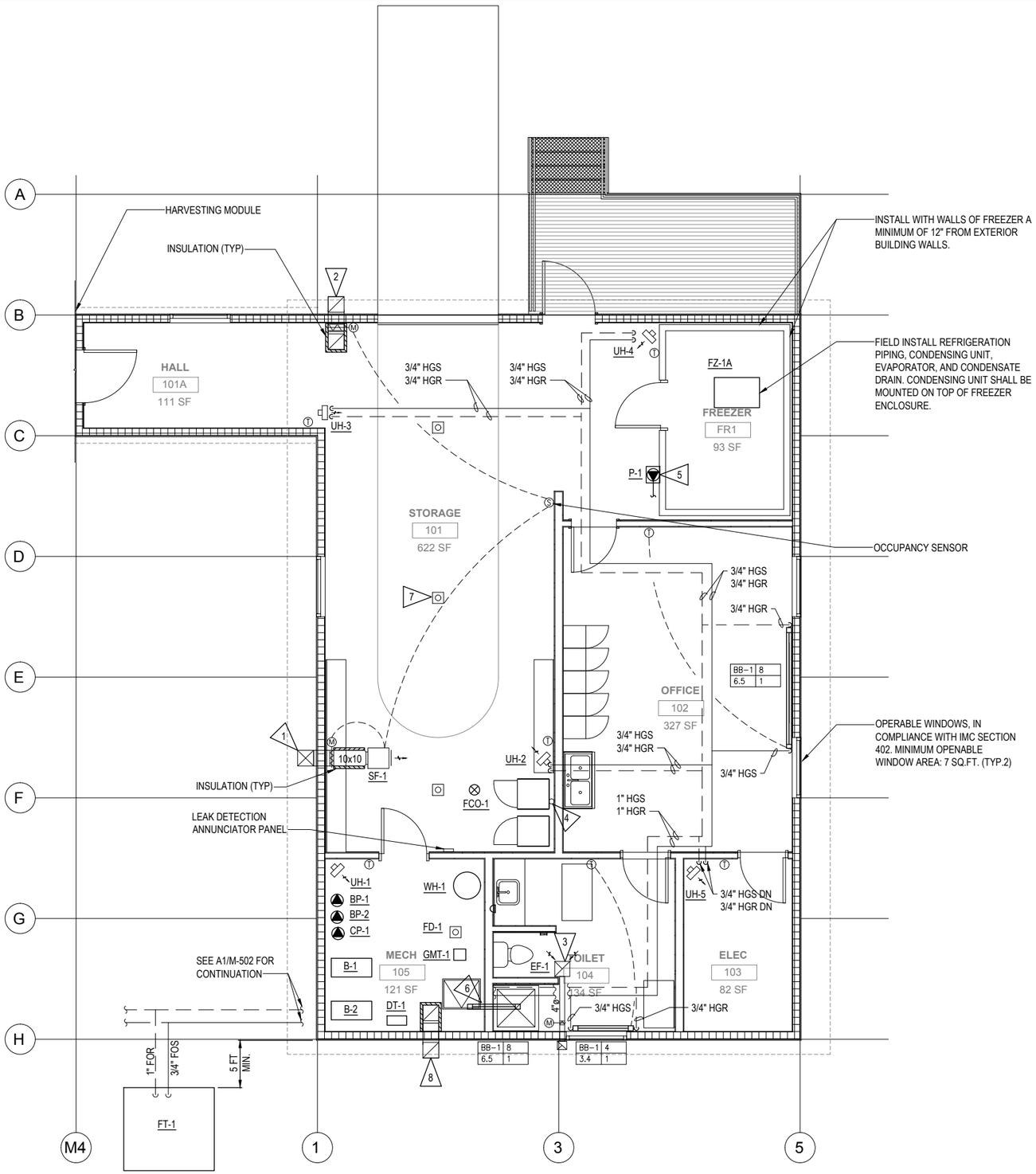
PROJ. NO.	231585
DRAWN	CJJ
CHECKED	MJM
DATE	12/15/2023

SHEET TITLE:

MECHANICAL NOTES, LEGEND, AND ABBREVIATIONS

SHEET NO:

M-001



A1 / M-100 MECHANICAL FLOOR PLAN

SCALE: 1/4" =1'-0"

NORTH

1/4"=1'-0" 0 1 2 3 4 6 8 12

GENERAL NOTES:

1. REFER TO SHEET M-110 FOR PLUMBING.
2. REFER TO C1/M-501 FOR BOILER PIPING DETAIL.
3. REFER TO C1/M-502 FOR WATER HEATER PIPING DETAIL.
4. REFER TO A1/M-501 FOR FUEL STORAGE TANK DETAIL.

SHEET NOTES:

1. SUPPLY FAN , SF-1. SUPPORT FROM ROOF STRUCTURE, MOUNT AS HIGH AS POSSIBLE. PROVIDE MERV 8 FILTER BANK UPSTREAM OF FAN. PROVIDE INSULATED, MOTORIZED DAMPER (TAMCO 9000 OR EQUAL) AND 10"x10" WALL HOOD. SEE DETAIL C1/M-500. INSULATE DUCTWORK BETWEEN HOOD AND FAN.
2. 10"x10" RELIEF HOOD WITH MOTORIZED, INSULATED DAMPER (TAMCO 9000 OR EQUAL) AND 10"x10" COLD AIR TRAP, MIN. 12" IN HEIGHT. INSULATE RELIEF DUCTWORK AND INTERLOCK TO OPEN WHEN SF-1 IS ON.
3. TOILET EXHAUST FAN, EF-1. MOUNT MINIMUM 8' A.F.F. PROVIDE MOUNTING STRUCTURE AS THERE IS NO CEILING IN THIS SPACE. PROVIDE INSULATED 4"ø DUCT, INTERLOCKED MOTORIZED, INSULATED DAMPER (TAMCO 9000 OR EQUAL) AND WALL HOOD.
4. 4"ø DRYER EXHAUST DUCT. INSTALL IN ACCORDANCE WITH IMC SECTION 504.9. ROUTE THROUGH FLOOR STRUCTURE AND TERMINATE AT BOTTOM OF FLOOR SOFFIT.
5. INSTALL CONDENSATE PIPING AS INDICATED AND COORDINATE INSTALLATION WITH FINAL EVAPORATOR LAYOUT, PER REFRIGERATION CONTRACTOR SYSTEM DESIGN. SLEEVE AND SEAL WALL PENETRATIONS. PROVIDE ELECTRIC HEAT TRACE FOR ALL CONDENSATE PIPING SUBJECT TO BELOW FREEZING TEMPERATURES. ROUTE DISCHARGE PIPING OVERHEAD. INDIRECT DRAIN TO MECH ROOM FLOOR DRAIN. PROVIDE MIN. 2" AIR GAP.
6. BB-1, IN FLOOR JOIST SPACE WITH VACUUM WASTE VALVE/SUMP. THIS SHALL BE PART OF THE TOILET ROOM HEATING ZONE. OMIT ENCLOSURE.
7. FD-1, NOT CONNECTED TO SANITARY SEWER. PIPE STRAIGHT DOWN AND TERMINATE DISCHARGE PIPE MIN. 6" OUTSIDE OF FLOOR SOFFIT (TYP. 3).
8. IN ACCORDANCE WITH IMC 701.1, TWO 10"x10" COMBUSTION AIR RELIEF HOODS WITH COLD AIR TRAP, MIN. 12" IN HEIGHT; ONE LOCATED 12" FROM TOP OF THE SPACE AND ONE 12" FROM THE BOTTOM.

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PROJ. NO.	231585
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DATE	12/15/2023

SHEET TITLE:

MECHANICAL FLOOR PLAN

SHEET NO:

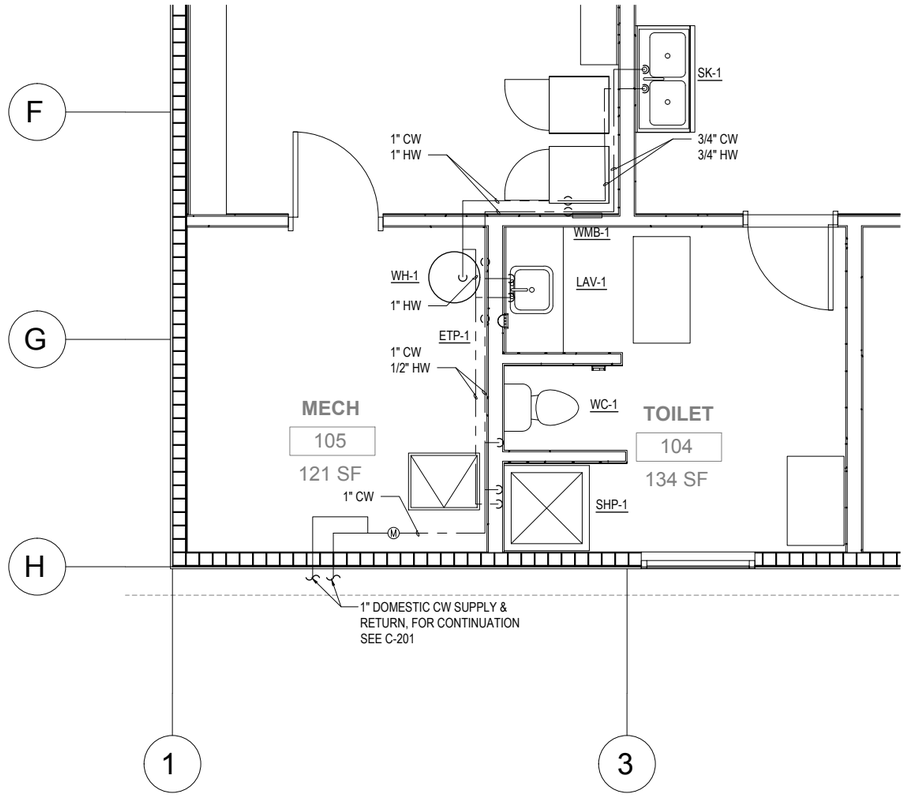
M-100

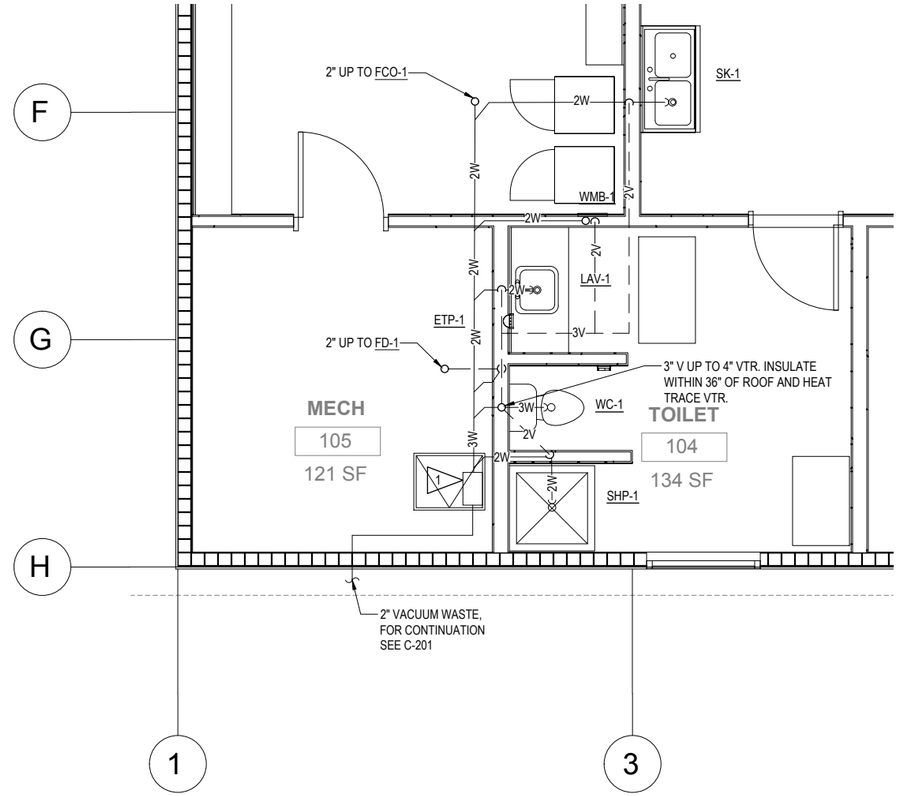
GENERAL NOTES:

1. SEE PLUMBING FIXTURE SCHEDULE FOR HW & CW CONNECTION SIZES. PROVIDE BALL VALVE FOR ISOLATION AT EACH FIXTURE.
2. PIPING SHOWN OFFSET FOR CLARITY.
3. REFER TO A3/M-500 FOR DOMESTIC WATER CONNECTION.

SHEET NOTES:

1. PACKAGED VACUUM WASTE VALVE AND 10 GALLON SUMP. VALVE SHALL BE MANUFACTURED BY AIRVAC AND SHALL BE COMPATIBLE WITH LOCAL VACUUM WASTE UTILITY. COORDINATE WITH AND OBTAIN APPROVAL OF EQUIPMENT FROM THE ENGINEER AND ANTHC.





A1 M-110 ENLARGED PLUMBING PLAN
SCALE: 3/8" = 1'-0"

NORTH

3/8"=1'-0" 0 1 2 3 4 6 8

A4 M-110 ENLARGED WASTE AND VENT PLAN
SCALE: 3/8" = 1'-0"

NORTH

3/8"=1'-0" 0 1 2 3 4 6 8

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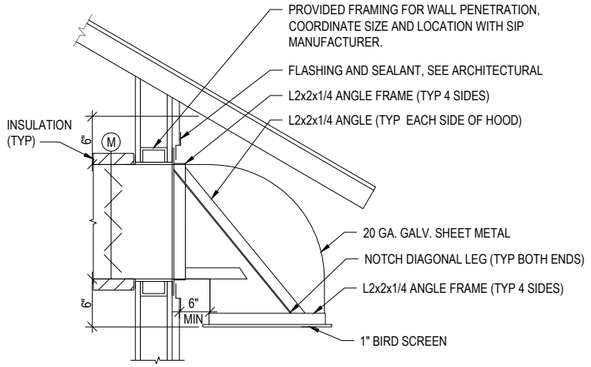
DRAWN	CJJ
CHECKED	MJM
DATE	12/15/2023

SHEET TITLE:

ENLARGED MECHANICAL PLAN

SHEET NO:

M-110

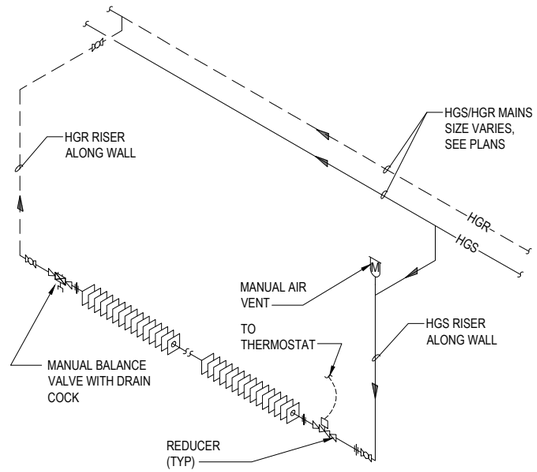


NOTE:

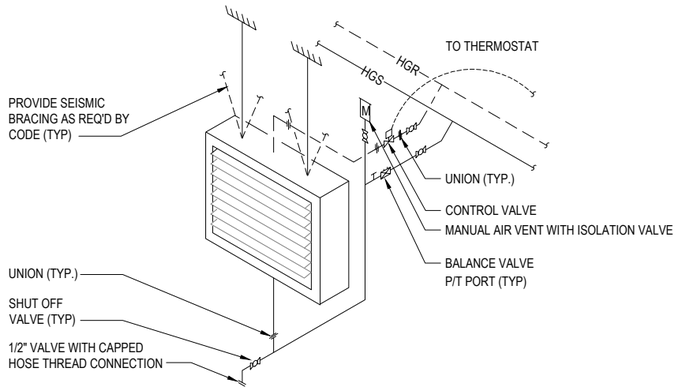
1. ENSURE HOOD DOES NOT EXTEND OUT PAST END OF ROOF OVERHANG.

2. ENSURE MIN. 6" FROM TOP OF WALL TO AVOID EXTERIOR CONFLICT WITH ROOF EVE.

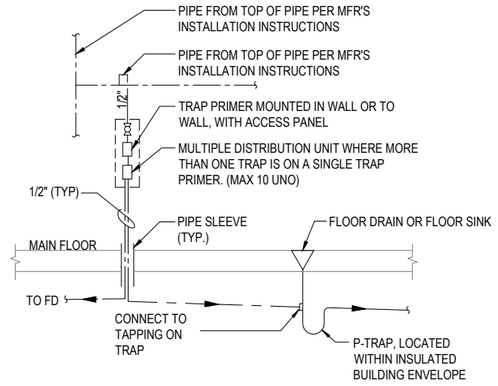
C1 WALL HOOD DETAIL
C1 / M-500 — SCALE: NTS



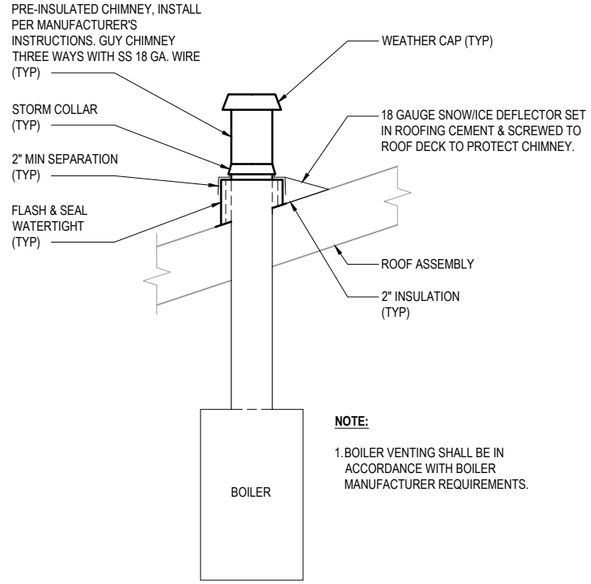
C2 BASEBOARD PIPING DETAIL
C2 / M-500 — SCALE: NTS



C4 HORIZONTAL UNIT HEATER
C4 / M-500 — SCALE: NTS



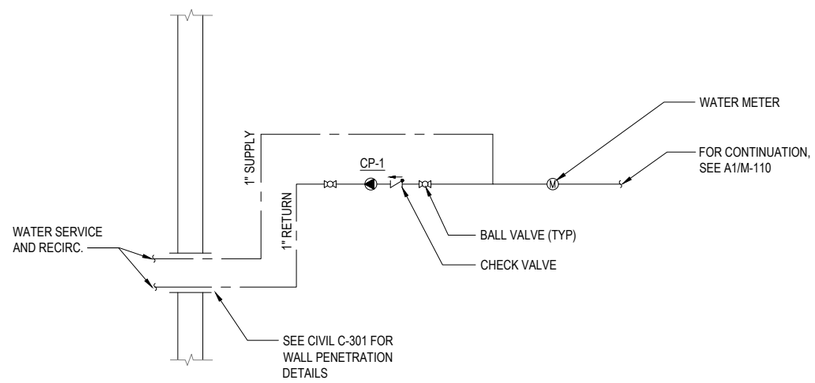
A1 TRAP PRIMER DETAIL
A1 / M-500 — SCALE: NTS



NOTE:

1. BOILER VENTING SHALL BE IN ACCORDANCE WITH BOILER MANUFACTURER REQUIREMENTS.

A2 BOILER FLUE DETAIL
A2 / M-500 — SCALE: NTS



A3 DOMESTIC WATER SUPPLY DETAIL
A3 / M-500 — SCALE: NTS

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STATE OF ALASKA 49 TH — BRENT L. LITTLE — Dec 19, 2023 — ME 12298 — REGISTERED PROFESSIONAL ENGINEER

KAWERAK

KAWERAK, INC.

SAVOONGA REINDEER PROCESSING FACILITY

BID DOCUMENTS

REV	DATE	DESCRIPTION

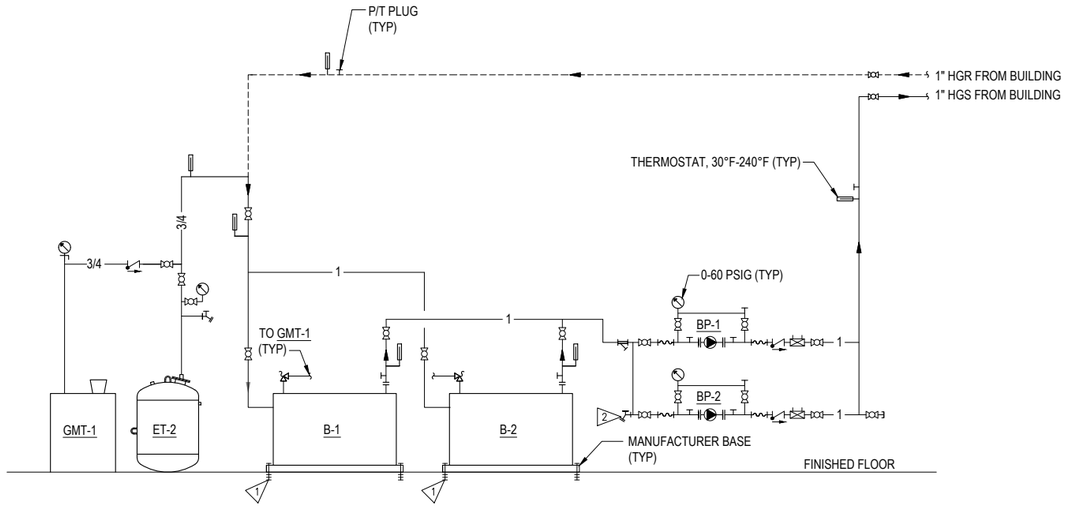
PROJ. NO.	231585
DRAWN	CJJ
CHECKED	MJM
DATE	12/15/2023

SHEET TITLE:

MECHANICAL DETAILS

SHEET NO:

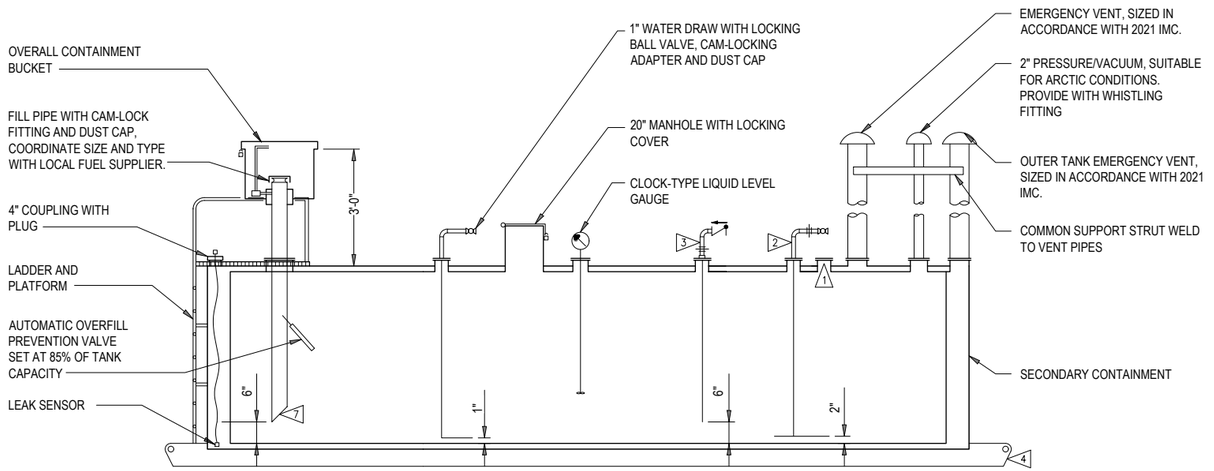
M-500



NOTE:

1. USE BOILER MANUFACTURER'S RECOMMENDED ATTACHMENT TO BOILER BASE FOR ANCHORING BOILER TO FLOOR STRUCTURE.
2. HOSE THREAD DRAINS WITH CAPS (TYP)
3. ONE PUMP SHALL OPERATE AT A TIME.

C1 / M-501 BOILER PIPING DETAIL
SCALE: NTS



NOTE:

1. 4" COUPLING WITH PLUG FOR TANK LEVEL SENSOR
2. SUPPLY, 3/4" DIPTUBE TO 2" FROM BOTTOM
3. 3/4" SPARE WITH CAP.
4. SKID
5. SUPPLY LINES SHALL INCLUDE REMOVABLE JOINT (UNION OR FLANGE) SHUT OFF VALVE, AND ANTI-SIPHON VALVE.
6. VENTS TERMINATE 12' ABOVE ADJACENT GROUND LEVEL. OVERFILL CONTAINMENT BUCKET INSTALLED TO FIT SERVICE PLATFORM.
7. CUT BOTTOM OF FILL DIPTUBE AT 45° ANGLE AT 6" FROM BOTTOM.
8. AREAS WITHIN 18" OF ALL TANK HATCHES AND VENTS ARE CLASSIFIED AS CLASS 1 DIVISION 2 LOCATION PER API 500.

A1 / M-501 FUEL OIL STORAGE TANK
SCALE: NTS

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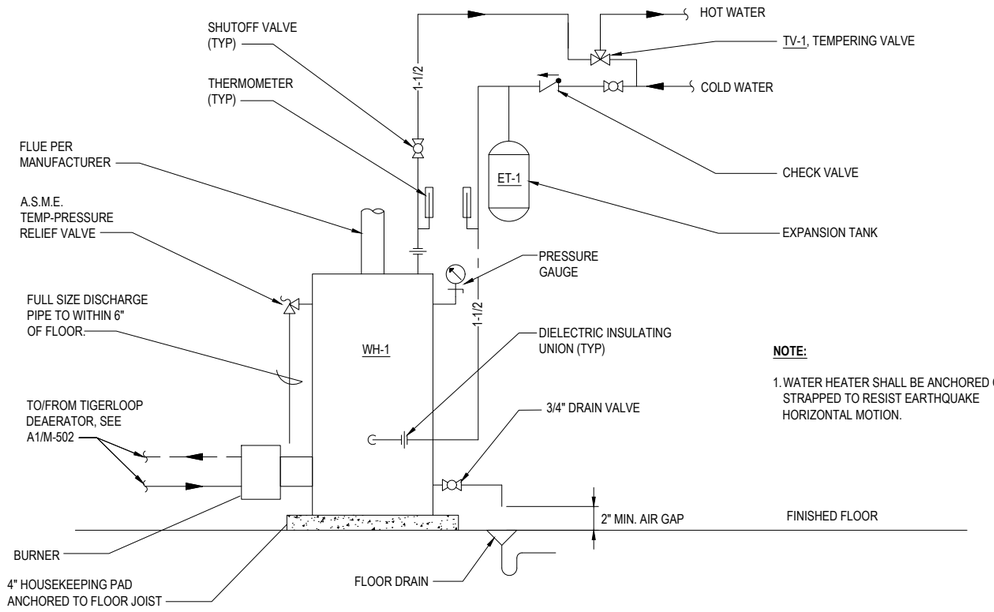
BID DOCUMENTS

REV	DATE	DESCRIPTION

PROJ. NO.	231585
DRAWN	CJJ
CHECKED	MJM
DATE	12/15/2023

SHEET TITLE:
MECHANICAL
DETAILS

SHEET NO:
M-501

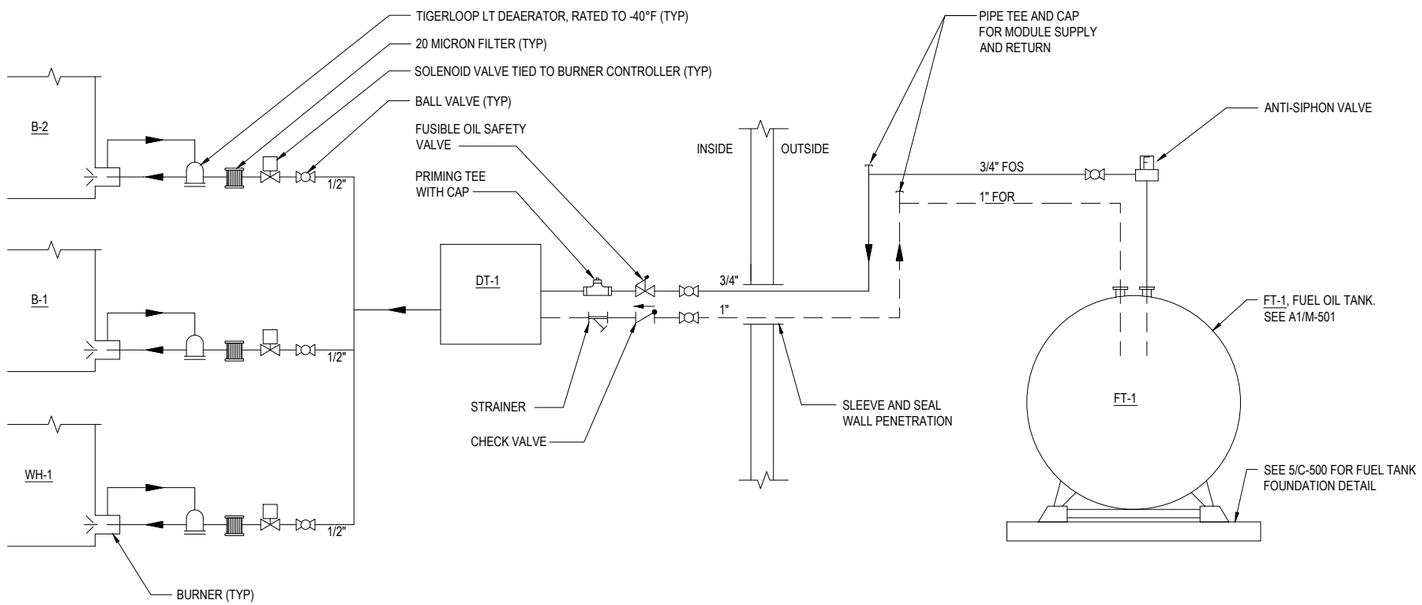


NOTE:

1. WATER HEATER SHALL BE ANCHORED OR STRAPPED TO RESIST EARTHQUAKE HORIZONTAL MOTION.

C1 / M-502 OIL-FIRED WATER HEATER PIPING DETAIL

SCALE: NTS



A1 / M-502 FUEL OIL PIPING DETAIL

SCALE: NTS

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BID DOCUMENTS

REV	DATE	DESCRIPTION

PROJ. NO.	231585
DRAWN	CJJ
CHECKED	MJM
DATE	12/15/2023

SHEET TITLE:

MECHANICAL DETAILS

SHEET NO:

M-502

BOILER SCHEDULE

TAG	TYPE	LOCATION	GROSS INPUT (MBH)	GROSS OUTPUT (MBH)	NOMINAL FIRING RATE (GPH)	EWT (°F)	LWT (°F)	VENT (INCH Ø)	FUEL TYPE	ELECTRICAL			BASIS OF DESIGN		NOTES
										VOLTAGE	PHASE	AMPS	MANUFACTURER	MODEL	
B-1	CAST IRON	MECH ROOM	98	86	0.7	160	180	6"	FUEL OIL	120	1	5.2	WEIL MC-LAIN	WGO-2	1-5
B-2	CAST IRON	MECH ROOM	98	86	0.7	160	180	6"	FUEL OIL	120	1	5.2	WEIL MC-LAIN	WGO-2	1-5

NOTES:
1. 92% EFFICIENT CAST IRON BOILER. NOx EMISSION <30 PPM. 80 PSI PRESSURE RATING, WORKING TEMPERATURE UP TO 194 DEGREES F.
2. PROVIDE WITH LOW WATER CUT OFF, ASME CD-1 SHUTDOWN, RESET CAPABILITY, OUTSIDE AIR LOCKOUT.
3. PROVIDE WITH TEMPERATURE HIGH LIMIT, AUTO RESET, FIELD ADJUSTABLE.
4. PROVIDE WITH STANDARD OIL BURNER, 120V/1PH. PROVIDE THE BURNER WITH A TIGERLOOP OIL DEAERATOR.
5. PROVIDE SPECIFIED PRODUCT OR APPROVED EQUAL. 1

UNIT HEATER SCHEDULE

TAG	TYPE	LOCATION	RATED CAPACITY (MBH)	FLUID %/ TYPE	EWT (F)	LWT (F)	FLOW (GPM)	EAT (F)	ELEMENT			BASIS OF DESIGN		NOTES
									VOLTS	PHASE	HP OR W	MFR	MODEL	
UH-1	HYDRONIC	MECH	6	50% PG	180	160	1	60	115	1	16 W	STERLING	HS-108A	1,2,3,4
UH-2	HYDRONIC	STORAGE	14	50% PG	180	160	2	60	115	1	16 W	STERLING	HS-118A	1,2,3,4
UH-3	HYDRONIC	STORAGE	14	50% PG	180	160	2	60	115	1	16 W	STERLING	HS-118A	1,2,3,4
UH-4	HYDRONIC	STORAGE	14	50% PG	180	160	2	60	115	1	16 W	STERLING	HS-118A	1,2,3,4
UH-5	HYDRONIC	ELEC	6	50% PG	180	160	1	60	115	1	16 W	STERLING	HS-108A	1,2,3,4

NOTES:
1. PROVIDE WITH LOW VOLTAGE REMOTE MOUNTED THERMOSTAT.
2. PROVIDE WITH WALL MOUNT KIT AND BRACKET.
3. PROVIDED WITH VIBRATION AND SEISMIC RESTRAINT.
4. PROVIDE SPECIFIED PRODUCT OR APPROVED EQUAL. 1

BASEBOARD SCHEDULE

TAG	ENCLOSURE					ELEMENT							BASIS OF DESIGN		NOTES
	TYPE	SIZE (IN.)		MOUNTING HEIGHT (IN)	COLOR	SIZE (IN.)			FIN/FT.	NO. OF TIERS	EGT (°F)	LGT (°F)	HTG. CAPACITY (BTU/FT)	MFR	MODEL	
		HT	DEPTH			TUBE	FIN. HT.	FIN. WIDTH								
BB-1	SLOPE TOP	11	4-3/8	15	PER ARCH	3/4	3-1/4	3-1/4	50	1	180	160	1320	STERLING	JVA-S11	1,2,3

NOTES:
1. RATINGS HAVE BEEN CORRECTED FOR 65°F ENTERING AIR TEMPERATURE, 180°F ENTERING GLYCOL TEMPERATURE, 50% PROPYLENE GLYCOL.
2. MOUNTING HEIGHT IS FROM FLOOR TO TOP OF FRONT PANEL OF ENCLOSURE
3. PROVIDE SPECIFIED PRODUCT OR APPROVED EQUAL. 1

FAN SCHEDULE

TAG	LOCATION	CFM	ESP (IN. W.C.)	DRIVE	MOTOR				BASIS OF DESIGN		NOTES
					FAN RPM	VOLTS	PHASE	HP or W	MFR.	MODEL	
EF-1	TOILET	75	0.1	DIRECT	900	115 V	1	18 W	GREENHECK	SP-B80	1,3
SF-1	STORAGE	400	0.1	DIRECT	1,725	115 V	1	1/6 HP	GREENHECK	SQ-80-VG6X-QD	2,3

NOTES:
1. FAN TO OPERATE IN CONJUNCTION WITH LIGHT SWITCH. PROVIDE WITH INTEGRAL SPRING DAMPER.
2. FAN TO BE ENERGIZE BASED ON ROOM TEMPERATURE.
3. PROVIDE SPECIFIED PRODUCT OR APPROVED EQUAL. 1

MISCELLANEOUS EQUIPMENT SCHEDULE

TAG	EQUIPMENT	LOCATION	CAPACITY (SQ. FT)	ELECTRICAL			DIMENSIONS	NOTES
				VOLTS	PHASE	HP		
FZ-1A	WALK-IN FREEZER	SUPPORT BUILDING	100	208	1	2	8' L x 10' W x 8.5' H	1-4

NOTES:
1. READY TO ASSEMBLE, 0°F REFRIGERATION SYSTEM UNIT.
2. INSTALL PER MANUFACTURER INSTRUCTIONS.
3. SEE SPECIFICATION 114120 FOR ADDITIONAL REQUIREMENTS.
4. PROVIDE SPECIFIED PRODUCT OR APPROVED EQUAL. 1

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STATE OF ALASKA 49TH
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Mar 19, 2024
ME 12298
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KAWERAK

KAWERAK, INC.

SAVOONGA REINDEER PROCESSING FACILITY

BID DOCUMENTS

REV	DATE	DESCRIPTION
1	03/19/24	EDA REVISIONS

PROJ. NO.	231585
DRAWN	CJJ
CHECKED	MJM
DATE	12/15/2023

SHEET TITLE:

MECHANICAL SCHEDULES

SHEET NO:

M-600

PLUMBING FIXTURES SCHEDULE

TAG	ITEM	CONNECTIONS				BASIS OF DESIGN		REMARKS
		WASTE	VENT	C.W.	H.W.	MFR	MODEL	
FIXTURES								
TV-1	TEMPERING VALVE	-	-	3/4"	3/4"	WATTS	LFMMV	THERMOSTATIC MIXING VALVE, RATED FOR DOMESTIC WATER, 1" SUPPLY OUTLET, 120 DEG F. FOR USE AS A MASTER MIXING VALVE WITH FLOWS OF 2.5GPM OR LESS (50% OF FLOW AT 10PSI). ASSE 1017, NSF 61.
LAV-1	LAVATORY	2"	2"	1/2"	1/2"	BOWL: KOHLER FAUCET: KOHLER	BOWL: K-2214-0 FAUCET: 45800-4	BOWL: 21" RECTANGULAR UNDERMOUNT BATHROOM SINK FAUCET: SINGLE LEVER FAUCET, SINGLE HOLE INSTALL, 0.5GPM AERATOR.
SH-1	SHOWER VALVE	-	-	1/2"	1/2"	DELTA	T13220-H20T	SINGLE PIVOT ACTION HANDLE, SHOWER TRIM KIT, LIMITED TO 1.3 GPM. ADJUSTABLE TEMPERATURE LIMIT STOP. PROVIDE SHOWER HEAD ARM AND FLANGE. INSTALL SH-1 IN SHP-1 BELOW.
SHP-1	SHOWER PAN	2"	2"	-	-	FIAT	ADAF3636	GELCOAT POLYESTER CONSTRUCTION. WHEELCHAIR ACCESSIBLE. PROVIDE WITH FD-1 FOR DRAINAGE. WITH TILE FLANGE. FULLY GROUT BASE. COORDINATE WITH SH-1 ABOVE.
SK-1	SINK	2"	2"	3/4"	3/4"	BOWL: ELKAY FAUCET: ELKAY	BOWL: LRAD332265PD FAUCET: LK5000	BOWL: STAINLESS STEEL DROP-IN DOUBLE BASIN SINK. SOUND DEADENING COATING. FAUCET: BRASS BODY CHROME FINISH SINGLE LEVER FAUCET WITH SWING SPOUT. ESCUTCHEON FOR THREE FAUCET HOLES. MAXIMUM OF 1.5GPM.
WC-1	WATER CLOSET	3"	2"	1/2"	-	AMERICAN STANDARD	CADET	FLOOR MOUNTED, VITREOUS CHINA, 1.28 GPF, ELONGATED BOWL, CLOSE-COUPLED GRAVITY TANK, 12" ROUGH IN, OPEN FRONT LID.
WMB-1	WASHING MACHINE CONNECTION BOX	2"	2"	3/4"	3/4"	GUY GRAY/IPS CORP	MWB-4	WASHING MACHINE CONNECTION BOX, RECESSED, WHITE POWDER COATED WITH A BRASS QUARTER TURN VALVE FOR HW/CW CONNECTIONS, COMPLIES WITH NSF61, NSF/ANSI 372, AND ASME A112.18.1.
DRAINAGE								
ETP-1	TRAP PRIMER	-	-	-	-	PPP	MP	1/2" CW SUPPLY. RECESSED MOUNT ENCLOSURE, ELECTRIC TRAP PRIMER, SURFACE MOUNT 18 INCHES ABOVE FINISHED FLOOR, 115 VAC.
FCO-1	FLOOR CLEANOUT	-	-	-	-	ZURN	ZN1400-BZ-NH-BP-USA	FINISHED FLOOR. CAST IRON BODY. SIZED TO MATCH PIPE SIZE.
FD-1	FLOOR DRAIN	-	-	-	-	ZURN	ZN415-NH-5B-P-USA	TRAP PRIMER W/ ROUND TOP. ROUGH FINISH IN UNOCCUPIED AREAS, NICKEL FINISH IN OCCUPIED AREAS.

TANK SCHEDULE

TAG	DESCRIPTION	BASIS OF DESIGN			NOTES
		MFR.	MODEL	CAPACITY	
FT-1	FUEL OIL TANK	GREER	CUSTOM	1000 GAL	UL 142 CONSTRUCTION, DOUBLE-WALLED ABOVEGROUND FUEL STORAGE TANK. PROVIDE WITH PRIMARY AND EMERGENCY VENTS. PROVIDE WITH PACKAGED LEAK DETECTION MONITORING SYSTEM AND ANNUNCIATOR PANEL.
DT-1	FUEL OIL DAY TANK	SIMPLEX	SST	25 GAL	UL 142 25 GALLON, DOUBLE WALLED, PACKAGED DAY TANK. PROVIDE WITH SUPPLY PUMP AND ANALOG CONTROLLER. 2"Ø PRIMARY AND 2"Ø SECONDARY EMERGENCY VENTS.120VOLT, 1/3 HP.

PUMP SCHEDULE

TAG	APPLICATION	FLOW (GPM)	HEAD (FT)	MOTOR SPEED (RPM)	MOTOR			BASIS OF DESIGN		NOTES
					VOLTS	PH	HP OR W	MFR	MODEL	
BP-1	HEATING CIRCULATION PUMP	9	20	3380	120	1	1/6 HP	B&G	ECOCIRC XL 36-45	-
BP-2	HEATING CIRCULATION PUMP	9	20	3380	120	1	1/6 HP	B&G	ECOCIRC XL 36-45	-
CP-1	DOMESTIC WATER CIRCULATION	7	18	-	120	1	45 W	GRUNDFOS	ALPHA 15-55 SF/LC	1
P-1	CONDENSATE PUMP	1	20	-	120	1	93 W	LITTLE GIANT	VCMA-20	-

NOTES:
1. BRONZE INTERNALS, NSF-61 LISTED.

WATER HEATER SCHEDULE

TAG	APPLICATION	EWT (F)	LWT (F)	RECOVERY RATE (GPH)	TYPE	ELECTRICAL			MFR	MODEL	SHIP WT (LBS)	UNIT DIMENSIONS (H" x DIA.")	NOTES
						VOLTAGE	PHASE	HP					
WH-1	DOMESTIC HOT WATER	45	140	191	FUEL OIL	120	1	1/8	AO SMITH	COF-199	553	75"x28"	1

NOTES:
1. 86 GAL, CONSERVATIONIST DURACLAD OIL-FIRED COMMERCIAL WATER HEATER.

EXPANSION TANK SCHEDULE

TAG	SYSTEM	BASIS OF DESIGN		TYPE	TANK VOLUME (GAL)	ACCEPT. VOLUME (GAL)	MIN. FILL TEMP (F)	OPERATING TEMP (F)	MAX. SYS TEMP (F)	CHARGE PSIG	RELIEF PSIG	NOTES
		MFR	MODEL									
ET-1	DOMESTIC HOT WATER	AMTROL	ST-12	BLADDER	6.4	3.2	35	140	150	55	90	2
ET-2	HIGH TEMP HEATING SYSTEM	AMTROL	AX-10-DD	BLADDER	6.4	3.2	40	140	180	12	30	1

NOTES:
1. WORKING FLUID: 50% PROPYLENE GLYCOL.
2. NSF-61 CERTIFIED FOR USE WITH POTABLE WATER.

GLYCOL MAKEUP TANK SCHEDULE

TAG	EQUIPMENT	SERVES	CAPACITY	ELECTRICAL			BASIS OF DESIGN		NOTES
				VOLTS	PHASE	HP OR W	MANUFACTURER	MODEL	
GMT-1	GLYCOL MAKEUP TANK	HEATING	6.6 GAL	120	1	50 W	AXIOM	MF200	1

NOTES:
1. INSTALL PER MANUFACTURER INSTRUCTIONS.

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BID DOCUMENTS

REV	DATE	DESCRIPTION

PROJ. NO.	231585
DRAWN	CJJ
CHECKED	MJM
DATE	12/15/2023

SHEET TITLE:
MECHANICAL SCHEDULES

SHEET NO:
M-601

GENERAL LIGHTING

- L1 — LIGHT FIXTURE IDENTIFICATION TAG: SEE FIXTURE SCHEDULE FOR TYPE
- SURFACE MOUNTED LIGHT FIXTURE
- WALL MOUNTED FIXTURE
- $ — 20A, 120/277V TOGGLE SWITCH
  - SUBSCRIPT INDICATES TYPE:
  - 2 - DOUBLE POLE
  - 3 - THREE WAY
  - 4 - FOUR WAY
  - T - WITH TIMER
  - L - WITH PILOT LIGHT
  - EP - EXPLOSION PROOF
  - O - OCCUPANCY SWITCH
- PC — PHOTO CELL
- OS — DUAL TECHNOLOGY OCCUPANCY SENSOR FOR LIGHTING CONTROL

EMERGENCY LIGHTING

- EMERGENCY LIGHT WITH BATTERY BACKUP
- REMOTE LIGHT HEAD

EXIT LIGHTING

- WALL MOUNTED ILLUMINATED EXIT SIGN
- ARROW INDICATES DIRECTION OF EGRESS

DISTRIBUTION

- COMBINATION STARTER/DISONNECT
- DISCONNECT SWITCH

GENERAL POWER

- EQUIPMENT CABINET
- XX-X — EQUIPMENT CONNECTION
- GROUND CONNECTION
- M — MOTOR CONNECTION
- PANELBOARD
- T — THERMOSTAT
- WALL MOUNTED - EQUIPMENT CONNECTION
- METER BASE - CT TYPE
- M — METER BASE - SELF CONTAINED
- TRANSFORMER

POWER OUTLETS

- GROUNDING TYPE DUPLEX RECEPTACLE -
  SUBSCRIPT INDICATES TYPE:
  EP - EXPLOSION PROOF
  G - GFCI
  WR - WEATHER RESISTANT
  WP - WEATHER PROOF WHILE IN USE COVER
- SPECIAL PURPOSE RECEPTACLE
- GROUNDING TYPE RECEPTACLE, 250V, 4 WIRE, NEMA 14-30R

HEAT TRACE

- L — LIGHTED END SEAL
- E — HEAT TRACE END KIT
- P — HEAT TRACE POWER KIT

ONE-LINE

- AUTOMATIC TRANSFER SWITCH
- CIRCUIT BREAKER
- CURRENT TRANSFORMER
- DISCONNECT SWITCH

GENERAL ANNOTATIONS

- XXXXXX — CABLE/CONDUIT TAG, REFER TO CABLE SCHEDULES
  - ## - CABLE/CONDUIT NUMBER
- XX / X–XXX — DETAIL REFERENCE BUBBLE
  - DETAIL / REFERENCE NUMBER
  - SHEET NUMBER WHERE DETAIL IS LOCATED
- XX-X — EQUIPMENT CONNECTION

ELECTRICAL LINE TYPES

- FLEXIBLE CONNECTION
- OHE — OVERHEAD ELECTRICAL
- UGE — UNDERGROUND ELECTRICAL
- UGC — UNDERGROUND COMMUNICATION

ELECTRICAL ABBREVIATIONS

ABBREVIATION	DESCRIPTION	ABBREVIATION	DESCRIPTION
A, AMP	AMPERE	SCH	SCHEDULE
AC	ALTERNATING CURRENT	SHLD	SHIELDED
AFC	AVAILABLE FAULT CURRENT	SM	SINGLE MODE
AFF	ABOVE FINISHED FLOOR	SOW	SCOPE OF WORK
AWG	AMERICAN WIRE GAUGE	SPD	SURGE PROTECTION DEVICE
BLDG	BUILDING	SSBJ	SUPPLY SIDE BONDING JUMPER
BRKR	BREAKER	STD	STANDARD
C	CABLE - CONDUIT - COIL - CELSIUS	SW	SWITCH
CAT	CATEGORY	SYS	SYSTEM
CB	CIRCUIT BREAKER	SUSE	SUITABLE FOR USE AS SERVICE EQUIPMENT
CEI	COFFMAN ENGINEERS INCORPORATED	TBD	TO BE DETERMINED
CKT	CIRCUIT	TEMP	TEMPORARY - TEMPERATURE
CNTL	CONTROL	TYP	TYPICAL
COMM	COMMUNICATIONS	UGC	UNDERGROUND COMMUNICATIONS
CT	CURRENT TRANSFORMER	UH	UNIT HEATER
CU	COPPER	UL	UNDERWRITERS LABORATORIES
DC	DIRECT CURRENT	V	VOLT
DISC	DISCONNECT	VA	VOLT AMPERE
DWG	DRAWING	VSD	VARIABLE SPEED DRIVE
EA	EACH	W	WATT, WIDE, WEST, WIRE
EF	EXHAUST FAN	WP	WEATHERPROOF-WHILE-IN-USE
EGC	EQUIPMENT GROUNDING CONDUCTOR	XFMR	TRANSFORMER
E&I	ELECTRICAL AND INSTRUMENTATION	Z	IMPEDANCE
(E), EXIST	EXISTING		
FOC	FIBER OPTIC CABLE		
GEC	GROUNDING ELECTRODE CONDUCTOR		
GFCI	GROUND FAULT CIRCUIT INTERRUPTER		
GFD	GROUND FAULT DETECTION		
GFI, G	GROUND FAULT INTERRUPTER		
GND, G	GROUND		
GRS	GALVANIZED RIGID STEEL		
HOA	HAND-OFF-AUTO		
HP	HORSEPOWER		
HT	HEAT TRACE		
IC	INTERRUPTING CAPACITY		
IN	INCH		
JB, J-BOX	JUNCTION BOX		
kAIC	THOUSAND AMPS INTERRUPTING CAPACITY		
kcmil	THOUSAND CIRCULAR MILS		
KVA	KILOVOLT AMPERES		
KW	KILOWATT		
LFMC	LIQUID-TIGHT FLEXIBLE METALLIC CONDUIT		
LFNC	LIQUID-TIGHT FLEXIBLE NON-METALLIC CONDUIT		
MDP	MAIN DISTRIBUTION PANEL		
MECH	MECHANICAL		
MIN	MINIMUM		
MM	MULTI MODE		
NEC	NATIONAL ELECTRICAL CODE		
NECA	NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION		
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION		
NEUT	NEUTRAL		
NRTL	NATIONAL RECOGNIZED TESTING LABORATORY		
NTS	NOT TO SCALE		
OCPD	OVER CURRENT PROTECTION DEVICE		
OH/E	OVERHEAD ELECTRICAL		
P	POLE		
PH	PHASE		
PJB	POWER JUNCTION BOX		
PNL	PANEL - PANELBOARD		
PVC	POLYVINYL CHLORIDE CONDUIT		
RECEPT	RECEPTACLE		
RM	ROOM		
RSC	RIGID STEEL CONDUIT		

ALL SYMBOLS AND ABBREVIATIONS DO NOT NECESSARILY APPEAR ON DRAWINGS

TELEPHONE AND DATA

- COMBINATION TELEPHONE/COMPUTER DATA OUTLET WITH 4 RJ45 DATA PORTS

ELECTRICAL SCOPE OF WORK OVERVIEW:

THIS PROJECT INCLUDES THE DESIGN AND CONSTRUCTION OF A REINDEER MEAT PROCESSING FACILITY, SUPPORT BUILDING, AND REMOTE CORRAL SITE IN SAVOONGA, AK. THE ELECTRICAL SCOPE OF WORK FOR THIS PROJECT INCLUDES THE FOLLOWING:

- POWER AND LIGHTING DESIGN FOR THE SUPPORT BUILDING THAT WILL PROVIDE POWER TO THREE SEPARATE PRE-FABRICATED MODULES RESPONSIBLE FOR REINDEER MEAT PROCESSING.
- THE SUPPORT BUILDING WILL HOUSE A WALK-IN FREEZER, STORAGE, OFFICE SPACE, BATHROOM, SHOWERS, LAUNDRY EQUIPMENT, AND ELECTRICAL DISTRIBUTION EQUIPMENT TO POWER THE SITE.
- REMOTE CORRAL SITE WILL HAVE SITE LIGHTING AND LOCAL POWER VIA A SMALL PANELBOARD AND GENERATOR INLET PLUG.

CLOSE COORDINATION WITH THE LOCAL ELECTRIC UTILITY, AVEC, WILL BE REQUIRED TO SUPPORT THE NEW ELECTRICAL SERVICE FOR THE SITE.

GENERAL NOTES:

1. THE ELECTRICAL INSTALLATION SHALL COMPLY WITH THE 2020 NATIONAL ELECTRICAL CODE, NFPA 72, STATE AND LOCAL AMENDMENTS, AND NECA STANDARDS OF INSTALLATION.
2. ALL ELECTRICAL EQUIPMENT AND MATERIALS SHALL BE LISTED AND LABELED FOR THEIR INTENDED APPLICATION BY A NATIONALLY RECOGNIZED TESTING LABORATORY ACCEPTABLE TO THE AUTHORITY HAVING JURISDICTION.
3. CONTRACTOR SHALL VERIFY LOCATION OF ALL EXISTING UTILITIES AND STRUCTURES AFFECTING THE WORK. NOTIFY THE PROJECT MANAGER IN WRITING OF ANY DISCREPANCIES BETWEEN EXISTING CONDITIONS AND THOSE SHOWN IN THE CONTRACT DOCUMENTS WHICH ADVERSELY IMPACT THE WORK.
4. CONTACT THE LOCAL UTILITY PROVIDER FOR UTILITY LINE LOCATES PRIOR TO COMMENCING EXCAVATION ON THE SITE.
5. EXISTING EQUIPMENT INFORMATION SHOWN ON THESE DRAWINGS SHOULD BE FIELD VERIFIED. CONFIRM NEW EQUIPMENT LOCATIONS WITH OWNER AND ADJUST AS REQUIRED.
6. APPROVED-EQUAL EQUIPMENT: EQUIPMENT SHOWN OR SPECIFIED ON THE DRAWINGS WAS USED AS THE BASIS-OF-DESIGN. DIFFERENT MAKES, MODELS AND MANUFACTURERS MAY BE PROVIDED WHEN THE SUBSTITUTE IS OF SUBSTANTIALLY THE SAME FUNCTION, QUALITY, RELIABILITY, ETC. AND HAS BEEN SUBMITTED AND APPROVED BY THE OWNER AS AN EQUIVALENT PRODUCT.
7. CONTRACTOR SHALL DISPOSE OF ALL DEMOLISHED AND UNUSED EQUIPMENT AND MATERIALS OFFSITE IN ACCORDANCE WITH LOCAL, STATE, AND FEDERAL REGULATIONS.
8. CONTRACTOR SHALL MAINTAIN A RED-LINE SET OF CONSTRUCTION DOCUMENTS DURING CONSTRUCTION. RED-LINE DRAWINGS SHALL BE SUBMITTED TO THE OWNER UPON PROJECT COMPLETION.
9. ALL WIRING INSTALLED IN UNHEATED OR EXTERIOR SPACES SHALL BE XHHW-2. INTERIOR WIRING MAY BE THHW/THHN UNLESS NOTED OTHERWISE.
10. CONDUCTORS SHALL BE #12 AWG COPPER MINIMUM OR AS SHOWN ON DRAWINGS. HOME RUN CONDUCTORS SHALL BE #10 AWG COPPER MINIMUM OR AS REQUIRED BY THE NEC. THE MINIMUM SIZE FOR 20A BRANCH CIRCUITS MEASURED FROM THE PANELBOARD TO THE FURTHEST DEVICE ON THE CIRCUIT UNLESS NOTED ON DRAWINGS:
    #10 AWG CONDUCTORS FOR 120V BRANCH CIRCUITS GREATER THAN 75'
    #8 AWG CONDUCTORS FOR 120V BRANCH CIRCUITS GREATER THAN 175'
    INCREASE GROUND CONDUCTOR SIZE PER NEC
    FOR 15A AND 20A CIRCUITS, TRANSITION TO #12 AWG WITHIN 15' OF DEVICE IF A SMALL CONDUCTOR IS REQUIRED FOR DEVICE TERMINATION.
11. THE CONTRACTOR SHALL PROVIDE AND INSTALL AN EQUIPMENT GROUNDING CONDUCTOR IN ALL CONDUITS OR CABLING.
12. ALL CONDUIT AND CABLE SHALL BE INSTALLED ORTHOGONAL TO THE STRUCTURE.
13. ALL CONDUCTOR SIZES SHOWN ARE BASED ON COPPER UNLESS NOTED OTHERWISE.
14. MAINTAIN A MINIMUM 6" CLEARANCE BETWEEN CONDUIT AND PIPING. MAINTAIN A 12" CLEARANCE BETWEEN CONDUIT AND HEAT SOURCES SUCH AS FLUES, HEATING PIPES, AND HEATING APPLIANCES.
15. VERIFY CEILING TYPES THROUGHOUT THE PROJECT PRIOR TO ORDERING LUMINAIRES. PROVIDE COMPATIBLE MOUNTING ACCESSORIES AND ALL TRIM, FLANGES, SUPPORTS, OUTLET BOXES, ETC. FOR A COMPLETE AND FINISHED INSTALLATION.
16. CIRCUIT NUMBERS ARE SHOWN NEXT TO LIGHTING FIXTURES AND ELECTRICAL DEVICES ONLY. REFER TO PANEL SCHEDULES AND ONE-LINE DIAGRAMS IF A CIRCUIT ASSIGNMENT IS NOT SHOWN ON THE PLANS. PROVIDE WIRING AS SHOWN ON DRAWINGS AND LISTED IN THE SPECIFICATIONS.
17. ANY PENETRATION OF THE BUILDING VAPOR BARRIER SYSTEM SHALL BE APPROPRIATELY SEALED TO RETAIN THE INTEGRITY OF THE WALL OR ROOFING SYSTEM. THIS INCLUDES, BUT IS NOT LIMITED TO, CONDUITS AND BACKS OF ELECTRICAL BOXES.
18. SEAL ALL RACEWAYS SUBJECT TO MOISTURE TRANSFER OR TRANSITIONING FROM INTERIOR TO EXTERIOR OF THE BUILDING IN ACCORDANCE WITH NEC. REFERENCE NEC 225.27, 230.8, 300.5(G) AND 300.7(A).
19. LOCATIONS OF LIGHT FIXTURES AND EQUIPMENT SHOWN ARE APPROXIMATE ONLY. SEE ARCHITECTURAL, PLUMBING, AND MECHANICAL DRAWINGS FOR EXACT LOCATIONS. COORDINATE THE ELECTRICAL INSTALLATION REQUIREMENTS WITH ALL TRADES TO PROVIDE A COMPLETE AND FULLY FUNCTIONAL FACILITY.
20. PROVIDE TYPED PANEL SCHEDULES FOR PANELS INSTALLED BY THIS PROJECT REFLECTING AS INSTALLED BRANCH CIRCUITING. PLACE TYPED SCHEDULES WITHIN PROTECTIVE SLEEVE ON INTERIOR OF PANEL DOOR.
21. DRAWINGS ARE SCHEMATIC ONLY AND DO NOT SHOW ALL CONDUIT AND CONNECTIONS BETWEEN RESPECTIVE DEVICES AND FIXTURES. CONTRACTOR SHALL DETERMINE THE EXACT ROUTING OF CONDUIT, CABLE, AND WIRING CONNECTIONS BETWEEN RESPECTIVE DEVICES AND FIXTURES FOR A COMPLETE AND OPERATIONAL SYSTEM.
22. EXISTING CONDITIONS SHOWN ON THESE DRAWING ARE BASED ON RECORD DRAWINGS, GOOGLE EARTH IMAGERY, AND A NON-DESTRUCTIVE SITE INVESTIGATION OF THE SITE. THERE IS NO WARRANTY OR GUARANTEE AS TO THE ACCURACY OF THE INFORMATION SHOWN HERE-IN. THE CONTRACTOR SHALL FIELD VERIFY EXISTING CONDITIONS AND ALL ITEMS SCHEDULED FOR DEMOLITION PRIOR TO THE START OF WORK.
23. PROVIDE ARC FLASH WARNING SIGNS ON ALL ELECTRICAL EQUIPMENT AS REQUIRED PER NFPA 70 ARTICLE 110.16, NFPA 70E, AND PROJECT SPECIFICATIONS.
24. PROVIDE AVAILABLE FAULT CURRENT (AFC) LABELING FOR SERVICE AND DISTRIBUTION EQUIPMENT IN ACCORDANCE WITH NEC 110.24(A) AND NEC 408.6. REFER TO E-500 FOR MORE INFORMATION.

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STATE OF ALASKA — 49TH — LOGAN R. HAINES — Dec 15, 2023 — No. EE12048 — REGISTERED PROFESSIONAL ENGINEER

KAWERAK
KAWERAK, INC.

SAVOONGA REINDEER PROCESSING FACILITY

BID DOCUMENTS

REV	DATE	DESCRIPTION

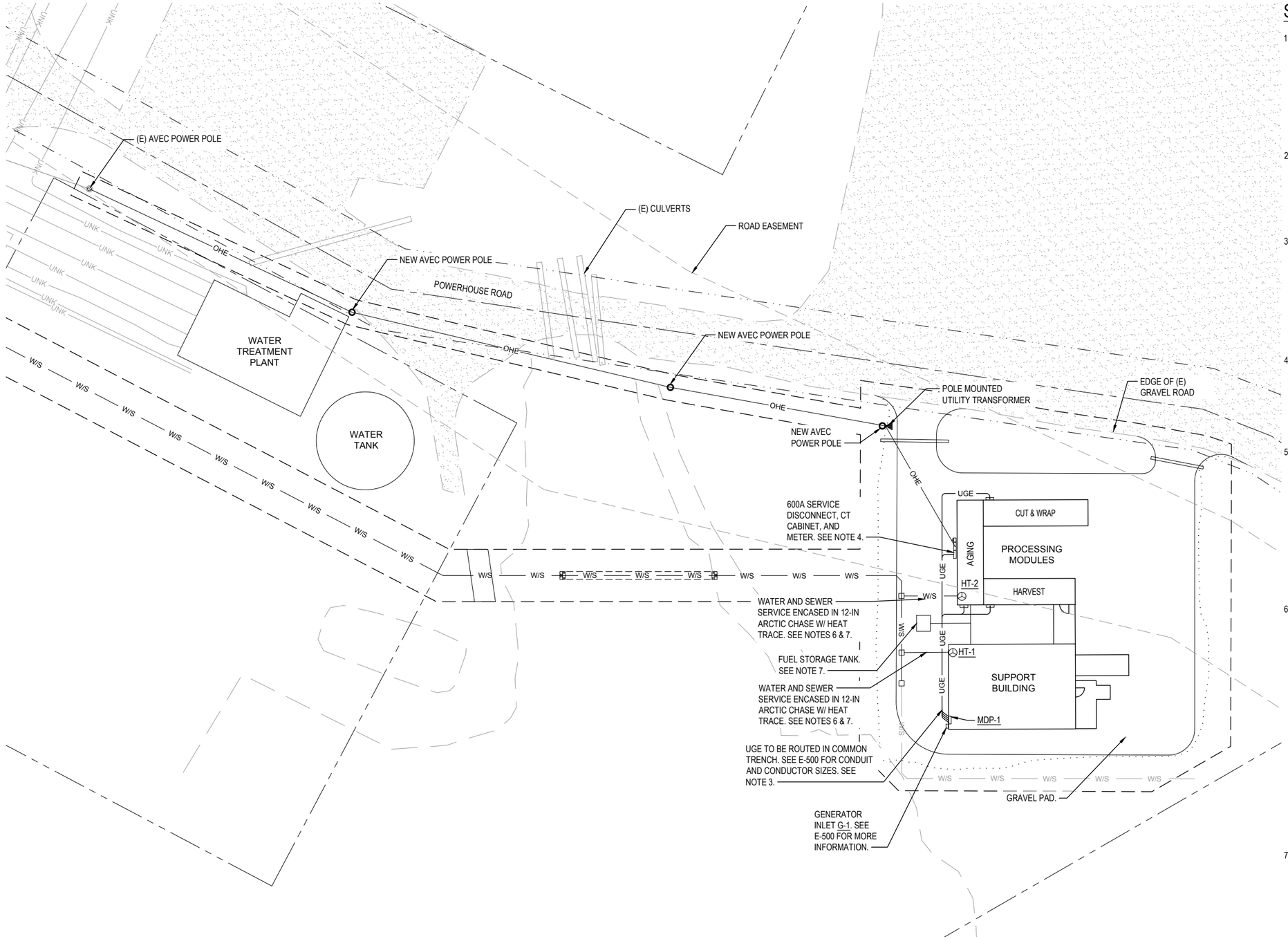
PROJ. NO.	231585
DRAWN	CTM
CHECKED	LRH
DATE	12/15/2023

SHEET TITLE:

ELECTRICAL NOTES, LEGEND, AND ABBREVIATIONS

SHEET NO:

E-001



SHEET NOTES:

1. LOCATION OF EXISTING UTILITIES ARE APPROXIMATE ONLY. CONTRACTOR SHALL VERIFY LOCATION BY OBTAINING UTILITY LOCATES PRIOR TO BEGINNING CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY ALL AREA UTILITY COMPANIES PRIOR TO COMMENCEMENT OF EXCAVATION.
2. UNDERGROUND CONDUIT AND WIRING MUST BE INSTALLED 24" BELOW GRADE. COMPACT AND BACKFILL TRENCH TO 95% MAXIMUM DRY DENSITY AND RE-GRADE TO MATCH SURROUNDING SOILS.
3. A UTILITY LINE EXTENSION (BY AVEC) FROM THE EXISTING POWER POLE ON POWERHOUSE ROAD IS REQUIRED TO INSTALL THE NEW ELECTRICAL SERVICE. COORDINATE NEW UTILITY LINE EXTENSION AND SERVICE WITH AVEC AND AVEC SERVICE STANDARDS FOR OVERHEAD SERVICES LARGER THAN 200A.
4. SUPPORT BUILDING MDP-1 PROVIDES POWER TO THE CUT & WRAP, AGING, AND HARVEST MODULES VIA SEPARATE FEEDERS AND CORRESPONDING DISCONNECTS. REFER TO E-500 FOR MORE INFORMATION.
5. PROVIDE ELECTRIC HEAT TRACE ON THE SEWER AND WATER SERVICE LINES TO THE SUPPORT BUILDING AND MODULES. EACH LINE WILL BE EQUIPPED WITH REDUNDANT HEAT TRACE CIRCUITS WITH ONE CIRCUIT RUN IN ARCTIC CHASE WITHIN THE ARCTIC PIPE AND ONE CIRCUIT RUN IN A 3/4" PEX LINE WITHIN THE ARCTIC PIPE. SEE POWER PLAN FOR HEAT TRACE CONNECTION LOCATION. SEE CIVIL DETAILS FOR HEAT TRACE LIGHTED END KIT DETAILS.
6. HEAT TRACE POWER CONNECTION FOR HT-2 WILL BE WITHIN THE PROCESSING MODULES. COORDINATE CIRCUITING CONNECTION WITH MODULE MANUFACTURER. HEAT TRACE POWER KITS SHALL BE RAYCHEM #JBS-100-A SINGLE ENTRY POWER CONNECTION KITS OR EQUAL. HEAT TRACE CABLE SHALL BE RAYCHEM #10QTVR2-CT 12W/FT 208V SELF REGULATING HEAT TRACE OR EQUAL. HEAT TRACE LIGHTED END KITS SHALL BE RAYCHEM #E-100-L-A OR APPROVED EQUAL. CONNECT ONE OF THE HEAT TRACE CIRCUITS ON THE ARCTIC PIPE TO THE POWER KIT, THE OTHER CIRCUIT WILL ACT AS STANDBY. COIL, TAPE, AND STORE THE STANDBY HEAT TRACE CIRCUIT ON THE WATER AND SEWER LINES.
7. THE HAZARDOUS LOCATION SURROUNDING THE DOUBLE WALL FUEL TANK INCLUDES CLASS 1 DIVISION 1 WITHIN THE TANK AND CLASS 1 DIVISION 2 WITHIN 18" OF ALL TANK VENTS AND OPENINGS PER NEC 514.3.

1 E-100 ELECTRICAL SITE PLAN
SCALE: 1" = 20'-0"

NORTH

1"=20'-0" 0 10 20 40 60

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SHEET TITLE:
ELECTRICAL SITE PLAN

SHEET NO:
E-100

GENERAL NOTES:

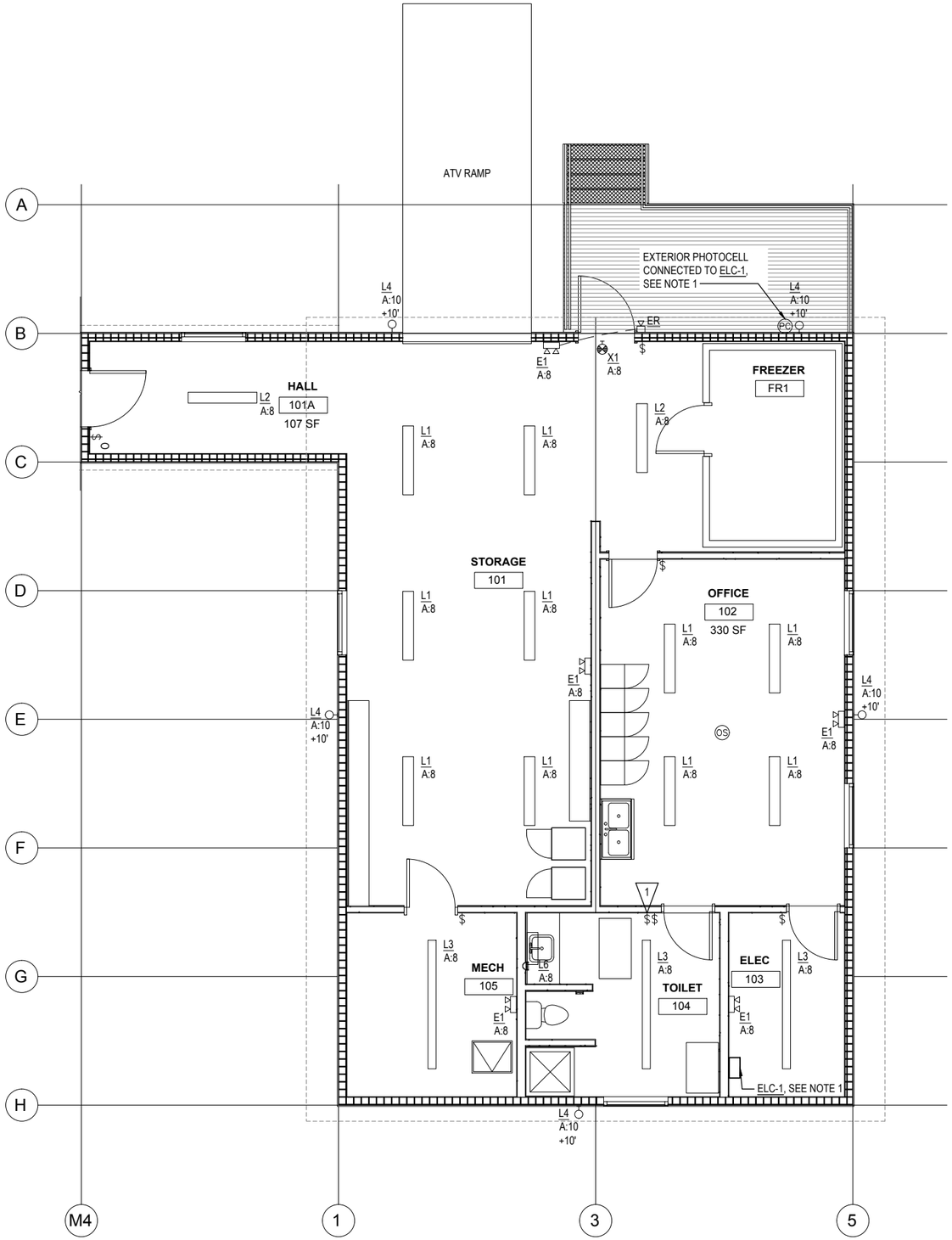
1. EXTERIOR LIGHTS SHALL BE WIRED THROUGH LIGHTING CONTACTOR ELC-1 FOR AUTOMATIC DUSK TO DAWN OPERATION. SEE DETAIL 2/E-101 FOR MORE INFORMATION.
2. CONFIRM ALL FIXTURES HAVE SUITABLE ACCESSORIES FOR SURFACE MOUNTING.
3. CONNECT EXIT SIGNS AND EMERGENCY LIGHTS TO THE UNSWITCHED LEG OF THE LOCAL AREA LIGHTING CIRCUIT.
4. LIGHTING AND CONTROL FOR FREEZER IS PROVIDED WITH THE FREEZER.
5. SEE ARCHITECTURAL PLANS FOR BUILDING ELEVATIONS.

SHEET NOTES:

1. PROVIDE EXHAUST FAN WALL SWITCH COLLOCATED WITH LIGHT SWITCH. SEE E-102 FOR MORE INFORMATION.

DETAIL NOTE:

1. GROUNDED AND GROUNDING CONDUCTORS FOR LIGHTING CIRCUITS NOT SHOWN.



2 E-101 EXTERIOR LIGHTING CONTROL DIAGRAM
SCALE: NTS

1 E-101 SUPPORT BUILDING LIGHTING PLAN
SCALE: 1/4" = 1'-0"

NORTH

1/4"=1'-0" 0 1 2 3 4 6 8 12

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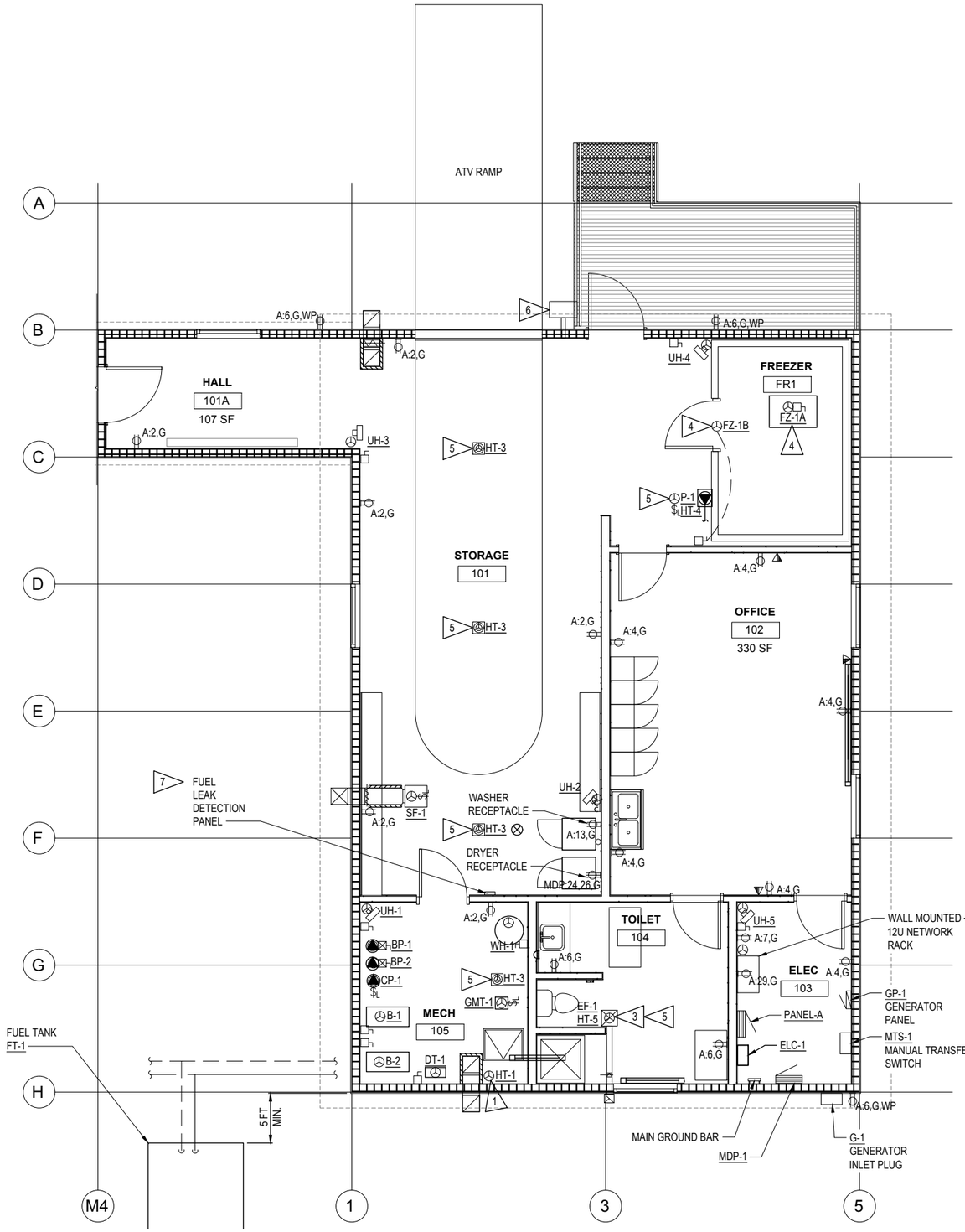
SHEET TITLE:

SUPPORT BUILDING LIGHTING PLAN

SHEET NO:

E-101



1 E-102 SUPPORT BUILDING POWER PLAN
SCALE: 1/4" = 1'-0"

NORTH

1/4"=1'-0" 0 1 2 3 4 6 8 12

GENERAL NOTES:

1. EQUIPMENT LOCATIONS SHOWN ARE APPROXIMATE. COORDINATE FINAL LOCATIONS WITH OWNER.
2. PROVIDE ALL DISCONNECTS, STARTERS, AND ASSOCIATED ELECTRICAL EQUIPMENT FOR FULLY FUNCTIONAL MECHANICAL SYSTEMS. REFER TO EQUIPMENT CONNECTION SCHEDULE ON SHEET E-600.
3. INSTALL RECEPTACLES AT 24"AFF UNLESS OTHERWISE NOTED.
4. REFER TO ONE-LINE DIAGRAM, EQUIPMENT CONNECTION SCHEDULE, AND PANEL SCHEDULES FOR DETAILED CIRCUITING.
5. DATA AND TELEPHONE CABLING SHALL TERMINATE AT THE TELECOM CABINET IN THE ELECTRICAL ROOM.
6. INSTALL HORIZONTAL TELECOM CABLING IN CONDUIT.
7. REFER TO E-501 FOR GROUND CONNECTIONS.

SHEET NOTES:

1. HEAT TRACE POWER KITS SHALL BE RAYCHEM #JBS-100-A SINGLE ENTRY POWER CONNECTION KITS OR EQUAL. HEAT TRACE CABLE SHALL BE RAYCHEM #10QTVR2-CT 12W/FT 208V SELF REGULATING HEAT TRACE OR EQUAL. CONNECT ONE OF THE HEAT TRACE CIRCUITS ON THE ARCTIC PIPE TO THE POWER KIT, THE OTHER CIRCUIT WILL ACT AS STANDBY. COIL, TAPE, AND STORE THE STANDBY HEAT TRACE CIRCUIT ON THE WATER AND SEWER LINES.
2. INSTALL 12RU WALL MOUNTED DATA CABINET WITH NETWORK SWITCH AND PATCH PANEL. COORDINATE INCOMING TELECOM SERVICE WITH THE LOCAL TELECOMMUNICATIONS UTILITY. CONNECT NETWORK SWITCH TO LOCAL 120VAC RECEPTACLE VIA A CORD AND PLUG. SEE E-500 FOR MORE INFORMATION.
3. PROVIDE WALL SWITCH FOR EF-1 MOUNTED NEXT TO LIGHT SWITCH FOR TOILET 104.
4. PROVIDE WARNING PLACARDING ON FZ-1A AND FZ-1B DISCONNECTS INDICATING FREEZER FZ-1 HAS MULTIPLE POWER SOURCES. SEE E-600 AND E-603 FOR MORE INFORMATION.
5. PROVIDE HEAT TRACE FOR FLOOR DRAINS, DRAIN LINE FROM EVAPORATOR, AND EXHAUST FAN VENT THROUGH ROOF, COORDINATE LOCATIONS AND CONNECTIONS WITH MECHANICAL. HEAT TRACE SHALL BE RAYCHEM SELF-REGULATING GM-2XT, 12W/F. RAYCHEM RAYCLIC-PC POWER CONNECTION/END SEAL KIT SHALL BE REQUIRED FOR INSTALLATION.
6. STARLINK ARRAY DISH WITH LONG MOUNTING ARM. LONG MOUNTING ARM SHALL BE MOUNTED JUST UNDER ROOF GABLE. PROVIDE SEALED 1" CONDUIT PENETRATION AND JUNCTION BOX FOR STARLINK CABLE. INSTALL STARLINK KIT AND MOUNT IN ACCORDANCE WITH MANUFACTURER INSTALLATION INSTRUCTIONS AND RECOMMENDATIONS.
7. COORDINATE CONTROLS WIRING FOR FUEL TANK LEAK DETECTION PANEL WITH MECHANICAL CONTRACTOR. ALL CABLING AND SENSORS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER INSTALLATION REQUIREMENTS AND NEC.

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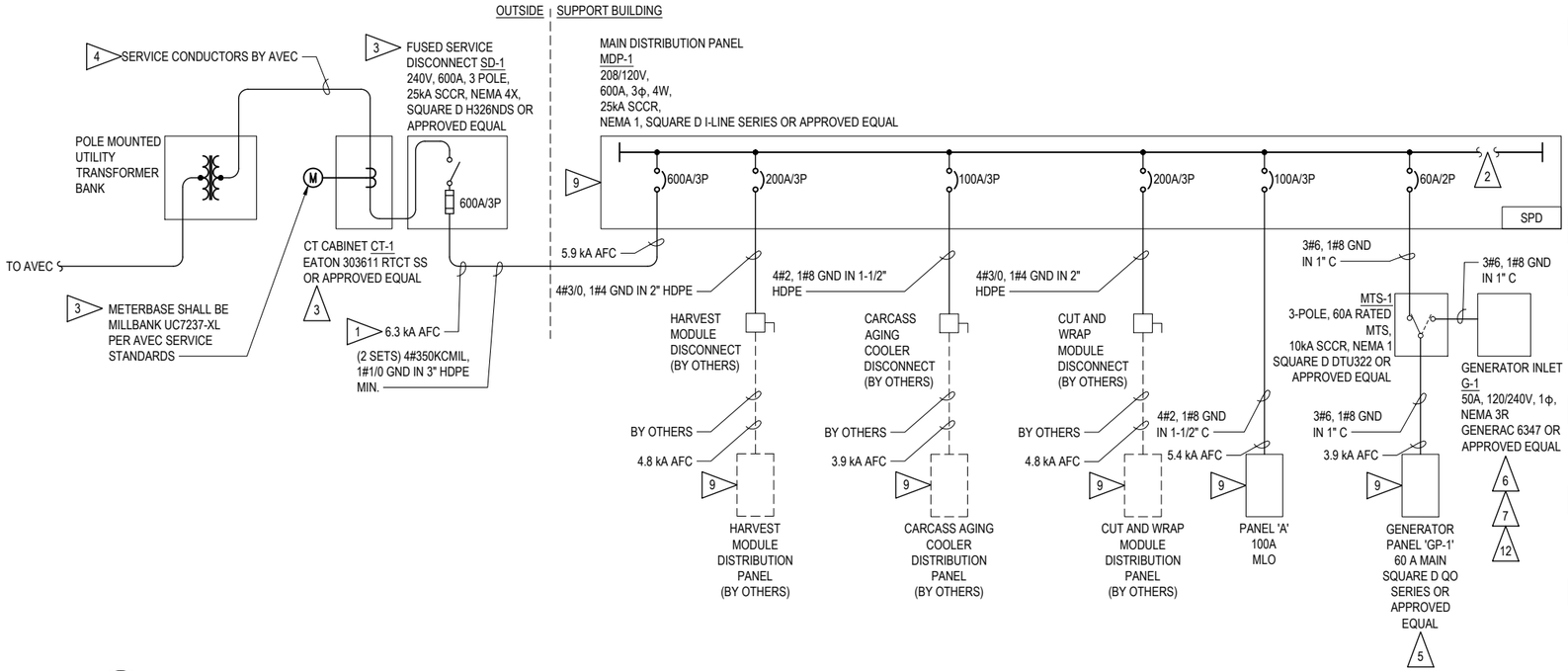
SHEET TITLE:

SUPPORT BUILDING POWER PLAN

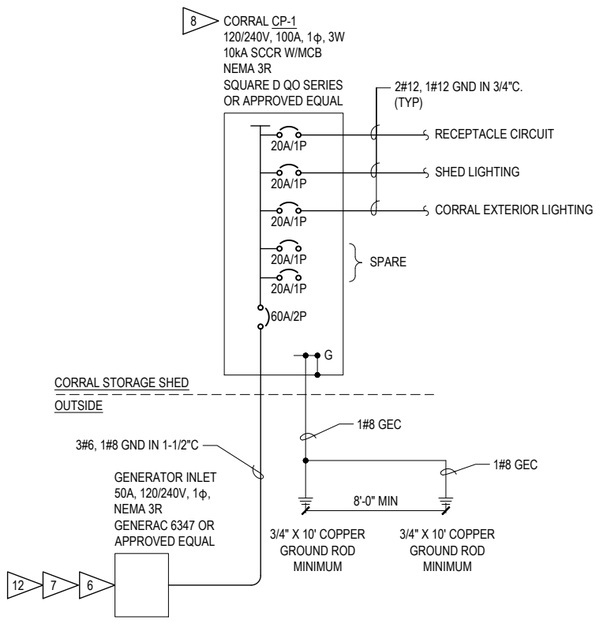
SHEET NO:

E-102



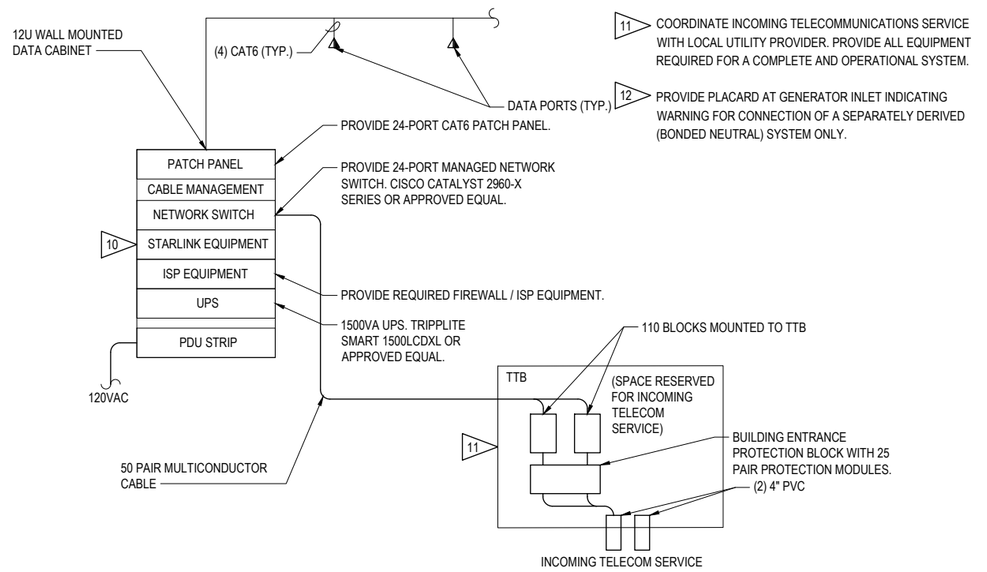
1 ELECTRICAL ONE-LINE DIAGRAM - PROCESSING

E-500 SCALE: NONE



2 ELECTRICAL ONE-LINE DIAGRAM - CORRAL

E-500 SCALE: NONE



3 TELECOM RISER DIAGRAM

E-500 SCALE: NTS

SHEET NOTES:

1. PROVIDE AVAILABLE FAULT CURRENT PLACARD IN ACCORDANCE WITH NEC 110.24. CALCULATED AVAILABLE FAULT CURRENT IS BASED ON AN ASSUMED TRANSFORMER BANK SIZE OF 75KVA, AN IMPEDANCE OF 5%, 60 FT. OF (3)#1/0 ALUMINUM SECONDARY SERVICE CONDUCTORS PER PHASE, AND AN INFINITE PRIMARY AVAILABLE FAULT CURRENT. CONTRACTOR SHALL CONTACT ENGINEERING SERVICES TO RE-CALCULATE THE AVAILABLE FAULT CURRENT BASED ON UTILITY SERVICE PROVIDED (AVEC) EQUIPMENT AND SITE CONDITIONS.
2. MAJOR ELECTRICAL LOADS SHOWN ONLY. SEE EQUIPMENT CONNECTION AND PANEL SCHEDULES FOR ALL CIRCUITING.
3. PROVIDE SERVICE EQUIPMENT AND INSTALLATION PER AVEC SERVICE STANDARDS.
4. COORDINATE SERVICE CONNECTION WITH AVEC. AVEC WILL PROVIDE AND CONNECT SERVICE CONDUCTORS UP TO THE WEATHER HEAD.
5. GENERATOR PANEL 'GP-1' IS TO PROVIDE POWER TO THE FREEZER AND CP-1 ONLY. IN THE EVENT OF A UTILITY POWER OUTAGE, A GENERATOR CAN PROVIDE POWER TO THE FREEZER AND WATER SERVICE CIRCULATION PUMP.
6. PROVIDE 50A CS6365 LOCKING PLUG TO L14-30R GENERATOR ADAPTOR CORD AND 20FT NEMA L14-30P/L14-30R GENERATOR CORD FOR GENERATOR CONNECTION TO GENERATOR INLET PLUG.
7. PROVIDE A HONDA EU7000IS 7000W, 120/240V INVERTER GENERATOR AT BOTH THE SUPPORT BUILDING AND REMOTE CORRAL SITE (2 GENERATORS TOTAL). STORE GENERATORS INSIDE WHILE NOT IN USE.
8. MOUNT CORRAL PNL-1 ON INTERIOR WALL OF CORRAL STORAGE SHED.
9. PROVIDE AFC PLACARDING IN ACCORDANCE WITH NEC 408.6.
10. PROVIDE STARLINK HIGH PERFORMANCE KIT WITH LONG WALL MOUNT. INSTALL IN ACCORDANCE WITH MANUFACTURER INSTALLATION INSTRUCTIONS AND RECOMMENDATIONS.
11. COORDINATE INCOMING TELECOMMUNICATIONS SERVICE WITH LOCAL UTILITY PROVIDER. PROVIDE ALL EQUIPMENT REQUIRED FOR A COMPLETE AND OPERATIONAL SYSTEM.
12. PROVIDE PLACARD AT GENERATOR INLET INDICATING WARNING FOR CONNECTION OF A SEPARATELY DERIVED (BONDED NEUTRAL) SYSTEM ONLY.

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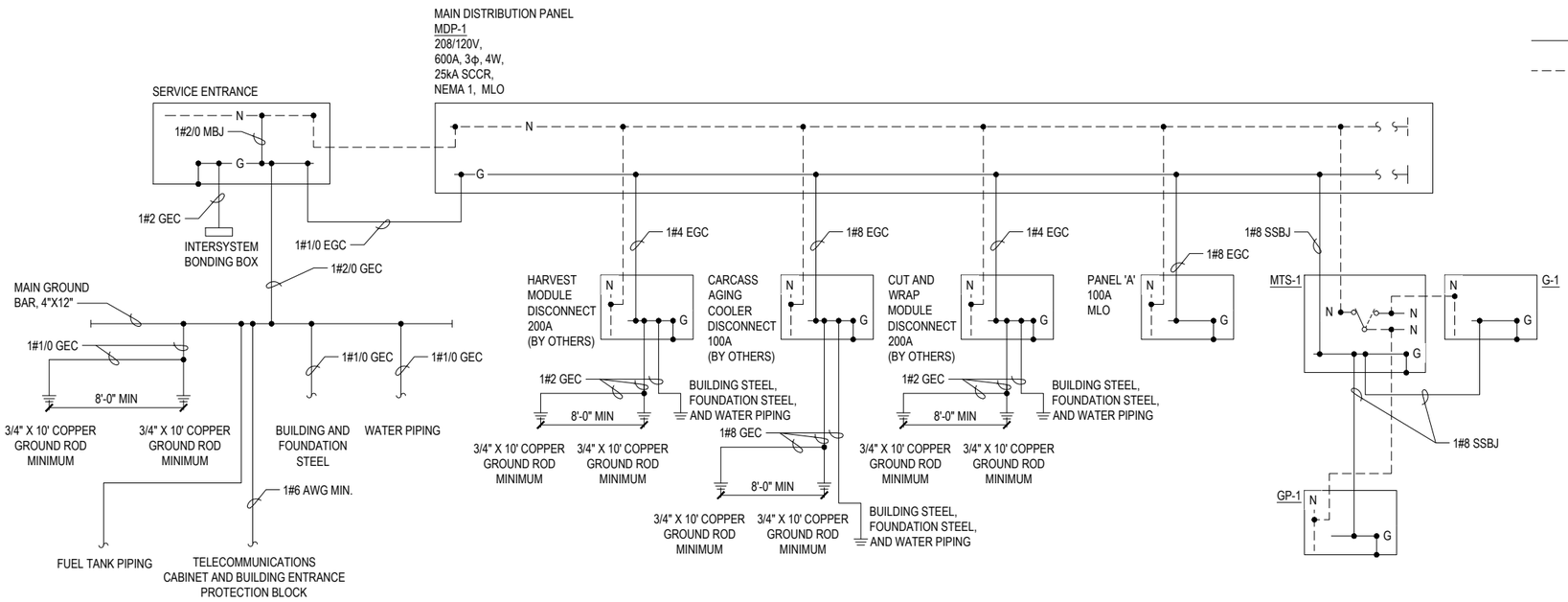
SHEET TITLE:

ELECTRICAL ONE-LINE DIAGRAM

SHEET NO:

E-500



GROUNDING LEGEND:

———	G	GROUNDING CONDUCTOR
- - - - -	N	NEUTRAL CONDUCTOR
	EGC	EQUIPMENT GROUNDING CONDUCTOR
	GEC	GROUNDING ELECTRODE CONDUCTOR
	MBJ	MAIN BONDING JUMPER
	MGB	MAIN GROUNDING BUSS BAR
	SSBJ	SUPPLY-SIDE BONDING JUMPER

1 / E-501 ELECTRICAL GROUNDING DIAGRAM

SCALE: NONE

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SHEET TITLE:
ELECTRICAL GROUNDING DIAGRAM

SHEET NO:
E-501

GENERAL NOTES:

1. CONTRACTOR TO PROVIDE CONTROL WIRING INTERFACE IN ACCORDANCE WITH MECHANICAL SEQUENCE OF OPERATION. COORDINATE REQUIRED EQUIPMENT INTERFACE AND WIRING REQUIREMENTS WITH MECHANICAL AND CONTROLS CONTRACTOR.
2. PROVIDE OVERLOAD PROTECTION FOR ALL MOTOR LOADS IN ACCORDANCE WITH NEC. COORDINATE REQUIRED MOTOR CONTROLS AND OVERLOAD PROTECTION WITH ACTUAL EQUIPMENT PROVIDED.
3. 208/120V CONTROLLERS SHALL HAVE A MINIMUM SCCR RATING OF 10kA.

SUPPORT BUILDING LOAD CALCULATION

220.12 GENERAL LIGHTING					
1700	SITE LIGHTING	0.5	VA/SF	0.9 KVA	
1700	SUPPORT BUILDING INTERIOR LIGHTING	3.5	VA/SF	6.0 KVA	
	NET LIGHTING LOAD:			**6.8 KVA**	**A**
220.44 RECEPTACLE LOAD					
12	RECEPTACLES @	180	VA EA	2.2 KVA	
	UP TO 10KVA AT 100%:			2.2 KVA	
	LOADS OVER 10KVA AT 50%:			0.0 KVA	
	NET RECEPTACLE LOAD:			**2.2 KVA**	**B**
220.50 MOTOR LOAD					
1	WALK IN FREEZER	2.88	KVA EA	2.88 KVA	
1	SUPPLY FAN	0.12	KVA EA	0.12 KVA	
2	BOILER CIRCULATION PUMP	0.53	KVA EA	1.06 KVA	
1	CONDENSATE PUMP	0.09	KVA EA	0.09 KVA	
1	GLYCOL MAKEUP TANK	0.05	KVA EA	0.05 KVA	
1	DOMESTIC HOT WATER CIRC PUMP	0.05	KVA EA	0.05 KVA	
1	EXHAUST FAN	0.02	KVA EA	0.02 KVA	
	25% OF LARGEST MOTOR (2HP)			0.72 KVA	
	NET MECHANICAL LOAD:			**5.0 KVA**	**C**
220.14 (A) SPECIFIC APPLIANCES OR LOADS					
5	SUPPORT BUILDING HEATERS	1.12	KVA EA	5.62 KVA	
1	WASHING MACHINE RECEPTACLE	0.50	KVA EA	0.50 KVA	
1	DRYER RECEPTACLE	2.50	KVA EA	2.50 KVA	
1	HARVEST MODULE SERVICE (200A FEED, 130A PEAK LOAD)	46.83	KVA EA	46.83 KVA	
1	CARCASS AGING COOLER SERVICE (100A FEED, 70A PEAK LOAD)	25.22	KVA EA	25.22 KVA	
1	CUT & WRAP MODULE SERVICE (200A FEED, 150A PEAK LOAD)	54.04	KVA EA	54.04 KVA	
100	HEAT TRACE (WATER SEWER) 12W/FT @50FT EA	0.01	KVA EA	1.20 KVA	
1	SUPPORT BUILDING WATER HEATER	0.40	KVA EA	0.40 KVA	
2	SUPPORT BUILDING BOILER	0.62	KVA EA	1.25 KVA	
	NET OTHER EQUIPMENT LOAD:			**137.6 KVA**	**D**
TOTAL LOAD CALCULATION					
	TOTAL CALCULATED NEC LOAD (A+B+C+D)			**151 KVA**	
15%	**SPARE CAPACITY**			**174 KVA**	
	MINIMUM SERVICE AMPS @	**208**	**V, 3Φ, 4W**	**484 A**	
	PROVIDED SERVICE AMPS			**600 A**	

*****CODE REFERENCES BASED ON 2020 NEC**

SUPPORT BUILDING ELECTRICAL EQUIPMENT CONNECTION SCHEDULE

TAG	DESCRIPTION	LOCATION	VOLTS	PHASE	HP	VA	CONTROLLER	CIRCUIT	FEEDER	NOTES
EF-1	EXAHUST FAN	BATHROOM	120 V	1	-	16	S	A:12	1/2"C, 2#12, 1#12G	1,4
SF-1	SUPPLY FAN	MECHANICAL ROOM	120 V	1	1/6	510	S	A:1	1/2"C, 2#12, 1#12G	1,4
FZ-1A	WALK IN FREEZER CONDENSER/EVAPORATOR	SUPPORT BUILDING	208 V / 240 V	1	2	2880	D	GP-1:1,3	1/2"C, 3#10, 1#10G	1
FZ-1B	WALK IN FREEZER LIGHT, DOOR HEAT, AND HEAT TRACE	SUPPORT BUILDING	120 V	1	-	500	D	GP-1:4	1/2"C, 2#12, 1#12G	1
UH-1	UNIT HEATER	ELEC	120 V	1	-	16	D	A:36	1/2"C, 2#12, 1#12G	1,4
UH-2	UNIT HEATER	ATV PARKING	120 V	1	-	16	D	A:36	1/2"C, 2#12, 1#12G	1,4
UH-3	UNIT HEATER	ATV PARKING	120 V	1	-	16	D	A:36	1/2"C, 2#12, 1#12G	1,4
UH-4	UNIT HEATER	ATV PARKING	120 V	1	-	16	D	A:36	1/2"C, 2#12, 1#12G	1,4
UH-5	UNIT HEATER	MECHANICAL ROOM	120 V	1	-	16	D	A:36	1/2"C, 2#12, 1#12G	1,4
B-1	BOILER	MECHANICAL ROOM	120 V	1	-	624	D	A:14	1/2"C, 2#12, 1#12G	1,4
B-2	BOILER	MECHANICAL ROOM	120 V	1	-	624	D	A:18	1/2"C, 2#12, 1#12G	1,4
WH-1	DOMESTIC HOT WATER HEATER	MECHANICAL ROOM	120 V	1	1/8	400	D	A:16	1/2"C, 2#12, 1#12G	1,4
BP-1	BOILER CIRCUILATION PUMP	MECHANICAL ROOM	120 V	1	1/6	528	C	A:3	1/2"C, 2#12, 1#12G	1,4
BP-2	BOILER CIRCUILATION PUMP	MECHANICAL ROOM	120 V	1	1/6	528	C	A:5	1/2"C, 2#12, 1#12G	1,4
CP-1	DOMESTIC WATER CIRCULATION	MECHANICAL ROOM	120 V	1	-	45	S	GP-1:2	1/2"C, 2#12, 1#12G	1,4
P-1	CONDENSATE PUMP	MECHANICAL ROOM	120 V	1	-	93	S	A:9	1/2"C, 2#12, 1#12G	1,4
GMT-1	GLYCOL MAKEUP TANK	MECHANICAL ROOM	120 V	1	-	50	S	A:11	1/2"C, 2#12, 1#12G	1,4
DT-1	DAY TANK	MECHANICAL ROOM	120 V	1	1/3	864	D	A:15	1/2"C, 2#12, 1#12G	1,4
HT-1	HEAT TRACE	MECHANICAL ROOM	208 V	1	-	360	D	MDP-1:16,18	1/2"C, 2#10, 1#10G	1,3
HT-2	HEAT TRACE	MODULES	208 V	1	-	360	D	MODULES	1/2"C, 2#10, 1#10G	1,2,3
HT-3	HEAT TRACE, SUPPORT BUILDING FLOOR DRAINS	SUPPORT BUILDING	208 V	1	-	360	D	A:22,24	1/2"C, 2#10, 1#10G	1
HT-4	HEAT TRACE, EVAPORATOR DRAIN LINE	SUPPORT BUILDING	208 V	1	-	360	D	A:21,23	1/2"C, 2#10, 1#10G	1
HT-5	HEAT TRACE, EXHAUST FAN VENT	SUPPORT BUILDING	208 V	1	-	360	D	A:28,30	1/2"C, 2#10, 1#10G	1

NOTES:
1. CONTRACTOR TO VERIFY ALL EQUIPMENT, CONNECTIONS, AND MATERIAL QUANTITIES.
2. CONTRACTOR TO COORDINATE HT-2 POWER CONNECTION WITH MODULE MANUFACTURER.
3. PROVIDE REDUNDANT HEAT TRACE RUNS WITH PRIMARY CONNECTED TO POWER AND THE STANDBY RUN PREPARED TO CONNECT TO LOCAL POWER KIT.
4. CONTRACTOR TO COORDINATE CONTROL CONNECTIONS WITH MECHANICAL CONTRACTOR.

CONTROLLER LEGEND:

D = DISCONNECT
FD = FUSED DISCONNECT
C = COMBINATION MOTOR STARTER/DISCONNECT
S = 20A PILOT LIGHT TOGGLE SWITCH
R = RECEPTACLE
M = MANUAL MOTOR STARTER/SWITCH

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LOGAN R. HAINES
Dec 15, 2023
No. EE12048
REGISTERED PROFESSIONAL ENGINEER

KAWERAK
KAWERAK, INC.

SAVOONGA REINDEER PROCESSING FACILITY

BID DOCUMENTS

REV	DATE	DESCRIPTION

PROJ. NO. 231585
DRAWN CTM
CHECKED LRH
DATE 12/15/2023

SHEET TITLE:
ELECTRICAL SCHEDULES

SHEET NO:
E-600

LIGHT FIXTURE SCHEDULE

FIXT. ID.	FIXTURE DESCRIPTION	FIXTURE VOLTAGE	FIXTURE WATTS	LAMP TYPE	FIXTURE MOUNTING	MANUFACTURERS PART NO.	REMARKS
L1	ENCLOSED AND GASKETED SURFACE MOUNTED 1'X4' LED FIXTURE WITH NEMA 4X FIBERGLASS HOUSING AND FROSTED ACRYLIC LENS. UL SANITATION CERTIFIED PER NSF STANDARDS. WET LOCATION AND IP65/IP67 RATED. STAINLESS STEEL LENS LATCHES.	120V	47W	6,000 LUMENS, LED ARRAY, 4000K, 80 CRI, L80 AT 60,000 HRS.	SURFACE	COLUMBIA NO. LEXM-4-40-HL-RFA-E-U-SSL OR APPROVED EQUAL.	PROVIDE WITH CONDUIT END HUBS FOR SURFACE MOUNTING.
L2	ENCLOSED AND GASKETED SURFACE MOUNTED 1'X4' LED FIXTURE WITH NEMA 4X FIBERGLASS HOUSING AND FROSTED ACRYLIC LENS. UL SANITATION CERTIFIED PER NSF STANDARDS. WET LOCATION AND IP65/IP67 RATED. STAINLESS STEEL LENS LATCHES.	120V	33W	4,000 LUMENS, LED ARRAY, 4000K, 80 CRI, L80 AT 60,000 HRS.	SURFACE	COLUMBIA NO. LEXM-4-40-LW-RFA-E-U-SSL OR APPROVED EQUAL.	PROVIDE WITH CONDUIT END HUBS FOR SURFACE MOUNTING.
L3	SURFACE MOUNTED 8' LONG LED STRIP FIXTURE WITH ROUND WHITE ACRYLIC LENS. DAMP LOCATION LISTED.	120V	92W	10,000 LUMENS, LED ARRAY, 4000K, 80 CRI, L70 AT 100,000 HRS.	SURFACE	CREE NO. LS-8-120L-840-R-UL-10V OR APPROVED EQUAL.	
L4	EXTERIOR WALL SURFACE MOUNTED FIXTURE WITH ALUMINUM HOUSING RATED IP66 AND -40 DEGREE F TEMPERATURE RATING. PHOTOCELL CONTROL.	120V	31W	4,200 LUMENS, LED ARRAY, 4000K, 70 CRI, L80 AT 100,000 HRS.	SURFACE	CREE NO. XSPW-B-WM-3ME-4L-40K-UL-BK-P OR APPROVED EQUAL.	
L5	EXTERIOR POLE MOUNTED FIXTURE WITH ALUMINUM HOUSING RATED IP66 AND -40 DEGREE F TEMPERATURE RATING.	120V	140W	18,000 LUMENS, LED ARRAY, 4000K, 70 CRI, L80 AT 100,000 HRS.	POLE MOUNT WITH ARM	CREE NO. XSPLG-D-HT-3ME-18L-40K7-UL-BK-N-J OR APPROVED EQUAL	PROVIDE WITH MOUNTING ARM TO AFFIX TO WOOD POLE
L6	24" LONG WALL OR CEILING SURFACE MOUNTED LED WRAP	120V	17W	1942 LUMEN LED, 3500K, 80 CRI, 50,000 HOUR LIFE (L 70)	SURFACE	LITHONIA NO. BLWP2-20L-ADP-EZ1-LP835 OR APPROVED EQUAL.	
X1	THERMOPLASTIC LED EXIT SIGN WITH RED LETTERS AND BATTERY BACKUP.	120V	1W	RED, LED	SURFACE	MULE LIGHTING NO. MX-B-R-U OR APPROVED EQUAL.	
E1	WALL MOUNTED, VANDAL RESISTANT DUAL HEAD LED EMERGENCY LIGHT WITH BATTERY BACKUP. NEMA 4X RATED.	120V	1W	12V, LED	SURFACE	MULE LIGHTING NO. PTR-12-36-5W LED-RC OR APPROVED EQUAL.	CAPABLE OF SERVING TYPE ER REMOTE HEADS.
ER	WALL MOUNTED, VANDAL RESISTANT DUAL HEAD LED EMERGENCY LIGHT REMOTE HEAD. NEMA 4X RATED AND -40 DEGREE F TEMPERATURE RATING.	120V	1W	12V, LED	SURFACE	MULE LIGHTING NO. H20-2-12V-5 OR APPROVED EQUAL.	SERVED FROM E1 EMERGENCY LIGHT.

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KAWERAK
KAWERAK, INC.

SAVOONGA REINDEER PROCESSING FACILITY

BID DOCUMENTS

REV	DATE	DESCRIPTION

PROJ. NO.	231585
DRAWN	CTM
CHECKED	LRH
DATE	12/15/2023

SHEET TITLE:

ELECTRICAL SCHEDULES

SHEET NO:

E-601

PANEL: MDP-1 | 208/120V 3 PHASE, 4 WIRE | MOUNTING: SURFACE
LOCATION: SUPPORT BLDG ELEC ROOM | 600 AMP BUS MAIN LUGS ONLY | GRND BUS: EQUIPMENT
SPECIAL: | SHORT CKT: 25 kAIC SCCR

CT	NOTES	CIRCUIT DESCRIPTION	LOAD (AMPS) A	B	C	BKR TRIP	POLES	WIRE SIZE	CKT NO	BUS	CKT NO	WIRE SIZE	POLES	BKR TRIP	LOAD (AMPS) A	B	C	CIRCUIT DESCRIPTION	NOTES	CT
4		HARVEST MODULE	130.0			200	3	3/0	1	A	2	2	3	100	35.5			PANEL A		3
		" "		130.0					3	B	4					35.5		" "		
		" "			130.0				5	C	6						35.5	" "		
4		CARCASS AGING COOLER MODULE	70.0			100	3	2	7	A	8	10	2	30	17.3			MANUAL TRANSFER SWITCH, MTS-1		3
		" "		70.0					9	B	10					17.3		" "		
		" "			70.0				11	C	12	10	2	30				SPARE		
4		CUT AND WRAP MODULE	150.0			200	3	3/0	13	A	14							" "		
		" "		150.0					15	B	16	10	2	30		1.7		SUPPORT BUILDING HEAT TRACE, HT-1	2	4
		" "			150.0				17	C	18						1.7	" "		
		SPARE				15	2	12	19	A	20	10	2	30				SPARE		
		" "							21	B	22							" "		
		SPARE				15	2	12	23	C	24	10	2	30			12.0	DRYER RECEPTACLE	1	4
		" "							25	A	26				12.0			" "		
		SPARE				15	2	12	27	B	28	10	2	30				SPARE		
		" "							29	C	30							" "		
		SPARE				15	2	12	31	A	32	10	2	30				SPARE		
		" "							33	B	34							" "		
		SPARE				15	2	12	35	C	36							SPACE		
		" "							37	A	38							SPACE		
		SPACE							39	B	40							SPACE		
		SPACE							41	C	42							SPACE		
		TOTAL:	350.0	350.0	350.0										64.9	54.6	49.3	:TOTAL		

TOTAL CONNECTED AMPS: A: 414.9 B: 404.6 C: 399.3

	CATEGORY (CT)	CONNECTED LOAD (KVA) THIS PNL	FED THRU	TOTAL	NEC DEMAND FACTOR	NEC DEMAND LOAD (KVA)
1	LIGHTING				125%	
2	RECEPTACLES				50% OVER 10 KVA	
3	EQUIPMENT (CONTINUOUS)	16.4		16.4	125%	20.5
4	EQUIPMENT (NON-CONTINUOUS)	129.0		129.0	100%	129.0
5	MOTORS Largest Motor 2 HP				125% LRGST LOAD	0.7
6	NON-COINCIDENT				0%	
7	NOT USED					
	TOTAL KVA	145.4		145.4		150.2
	NEC 215.2 MINIMUM FEEDER AMPACITY:					416.8

NOTES:
1. PROVIDE GFCI 5MA CIRCUIT BRKR
2. PROVIDE GFPE CIRCUIT BRKR

PANEL: PNL-A | 208/120V 3 PHASE, 4 WIRE | MOUNTING: SURFACE
LOCATION: SUPPORT BLDG ELEC ROOM | 100 AMP BUS MAIN LUGS ONLY | GRND BUS: EQUIPMENT
SPECIAL: | SHORT CKT: 25 kAIC SCCR

CT	NOTES	CIRCUIT DESCRIPTION	LOAD (AMPS) A	B	C	BKR TRIP	POLES	WIRE SIZE	CKT NO	BUS	CKT NO	WIRE SIZE	POLES	BKR TRIP	LOAD (AMPS) A	B	C	CIRCUIT DESCRIPTION	NOTES	CT
5		SUPPLY FAN, SF-1	4.3			15	1	12	1	A	2	12	1	20	7.5			ATV PARKING RECEPTS & ELEC ROOM RECEP	1	2
5		BOILER CIR PUMP, BP-1		4.4		15	1	12	3	B	4	12	1	20		4.5		OFFICE RECEPTS		2
5		BOILER CIR PUMP, BP-2			4.4	15	1	12	5	C	6	12	1	20			6.0	BATHROOM AND OUTDOOR RECEPTS	1	2
		SPACE							7	A	8	12	1	20	15.8			INTERIOR LIGHTING		1
5		P-1		0.8		15	1	12	9	B	10	12	1	20		8.3		EXTERIOR LIGHTING		1
4		GMT-1			0.4	15	1	12	11	C	12	12	1	15			0.1	EXHAUST FAN, EF-1		5
4	1	WASHING MACHINE RECEPTACLE	4.3			15	1	12	13	A	14	12	1	20	5.2			BOILER, B-1		4
5		DT-1, DAY TANK		7.2		20	1	12	15	B	16	12	1	20		3.3		DOMESTIC HOT WATER, WH-1		4
		SPARE				20	1	12	17	C	18	12	1	20			5.2	BOILER, B-2		4
		SPARE				20	1	12	19	A	20	12	1	20	4.2			MOTORIZED MECHANICAL DAMPER MOTORS		4
4	2	EVAPORATOR DRAIN LINE HEAT TRACE, HT-4		2.4		30	2	10	21	B	22	10	2	30		2.4		FLOOR DRAIN HEAT TRACE, HT-3	2	4
		" "			2.4				23	C	24						2.4	" "		
		SPARE				30	1	10	25	A	26	12	1	20				SPARE		
		SPARE				20	1	12	27	B	28	10	2	30		2.4		EXHAUST FAN VENT HEAT TRACE, HT-5	2	4
3		IT RACK PDU			4.2	20	1	12	29	C	30						2.4	" "		
		SPARE				20	1	12	31	A	32							SPACE		
		SPACE							33	B	34							SPACE		
		SPACE							35	C	36	12	1	20			0.7	UH-1 - UH-5, SUPPORT BUILDING UNIT HEATERS		5
		SPACE							37	A	38							SPACE		
		SPACE							39	B	40							SPACE		
		SPACE							41	C	42	12	1	20			4.2	FUEL LEAK DETECTION PANEL		3
		TOTAL:	8.5	14.8	11.4										32.7	21.0	21.0	:TOTAL		

TOTAL CONNECTED AMPS: A: 41.2 B: 35.8 C: 32.4

	CATEGORY (CT)	CONNECTED LOAD (KVA) THIS PNL	FED THRU	TOTAL	NEC DEMAND FACTOR	NEC DEMAND LOAD (KVA)
1	LIGHTING	2.9		2.9	125%	3.6
2	RECEPTACLES	2.2		2.2	50% OVER 10 KVA	2.2
3	EQUIPMENT (CONTINUOUS)	1.0		1.0	125%	1.3
4	EQUIPMENT (NON-CONTINUOUS)	4.2		4.2	100%	4.2
5	MOTORS Largest Motor 1/4 HP	2.6		2.6	125% LRGST LOAD	2.8
6	NON-COINCIDENT				0%	
7	NOT USED					
	TOTAL KVA	12.9		12.9		14.0
	NEC 215.2 MINIMUM FEEDER AMPACITY:					39.0

NOTES:
1. PROVIDE GFCI 5MA CIRCUIT BRKR
2. PROVIDE GFPE CIRCUIT BRKR

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KAWERAK
KAWERAK, INC.

SAVOONGA REINDEER PROCESSING FACILITY

BID DOCUMENTS

REV	DATE	DESCRIPTION

PROJ. NO. 231585
DRAWN CTM
CHECKED LRH
DATE 12/15/2023

SHEET TITLE:
ELECTRICAL SCHEDULES

SHEET NO:
E-602

PANEL: GP-1 | 120/240V, 1 PHASE, 3 WIRE | MOUNTING: SURFACE
LOCATION: ELECTRICAL ROOM | 60 AMP BUS | 60 AMP MAIN BREAKER | GRND BUS: EQUIPMENT
SPECIAL: | SHORT CKT: 10 kAIC SCCR

CT	NOTES	CIRCUIT DESCRIPTION	LOAD (AMPS) L1	LOAD (AMPS) L2	BKR TRIP	POLES	WIRE SIZE	CKT NO	BUS	CKT NO	WIRE SIZE	POLES	BKR TRIP	LOAD (AMPS) L1	LOAD (AMPS) L2	CIRCUIT DESCRIPTION	NOTES	CT
5	1	FZ-1A, FREEZER EVAP/CONDENSER	12.0		30	2	10	1	L1	2	12	1	15	0.4		CP-1		5
		" "		12.0				3	L2	4	12	1	15		4.2	FZ-1B, FREEZER LIGHTS, DOOR HEAT, HT	1	1
		SPACE						5	L1	6						SPACE		
		SPACE						7	L2	8						SPACE		
		TOTAL:	12.0	12.0										0.4	4.2	:TOTAL		
		TOTAL CONNECTED AMPS: L1: 12.4 L2: 16.2																

	CATEGORY (CT)	CONNECTED LOAD (KVA) PNL	FED THRU	TOTAL	NEC DEMAND FACTOR	NEC DEMAND LOAD (KVA)
1	LIGHTING	0.5		0.5	125%	0.6
2	RECEPTACLES				50% OVER 10 KVA	
3	EQUIPMENT (CONTINUOUS)				125%	
4	EQUIPMENT (NON-CONTINUOUS)				100%	
5	MOTORS Largest Motor 2 HP	2.9		2.9	125% LRGST LOAD	3.6
6	NON-COINCIDENT				0%	
7	NO DIVERSITY				100%	
	TOTAL KVA	3.4		3.4		4.3
	NEC 215.2 MINIMUM FEEDER AMPACITY:					17.8

NOTES:
1. PROVIDE GFCI 5MA CIRCUIT BRKR

PANEL: CP-1 | 120/240V, 1 PHASE, 3 WIRE | MOUNTING: SURFACE, NEMA 3R
LOCATION: CORRAL STORAGE SHED | 60 AMP BUS | 60 AMP MAIN BREAKER | GRND BUS: EQUIPMENT
SPECIAL: | SHORT CKT: 10 kAIC SCCR

CT	NOTES	CIRCUIT DESCRIPTION	LOAD (AMPS) L1	LOAD (AMPS) L2	BKR TRIP	POLES	WIRE SIZE	CKT NO	BUS	CKT NO	WIRE SIZE	POLES	BKR TRIP	LOAD (AMPS) L1	LOAD (AMPS) L2	CIRCUIT DESCRIPTION	NOTES	CT
2	1	SHED RECEPTACLES	6.7		20	1	10	1	L1	2	12	1	20	4.2		CORRAL EXTERIOR LIGHTING	1	1
1	1	SHED LIGHTING		4.2	20	1	12	3	L2	4	12	1	20			SPACE		
		SPARE			20	1	12	5	L1	6						SPACE		
		SPARE			20	1	12	7	L2	8						SPACE		
		SPACE						9	L1	10						SPACE		
		SPACE						11	L2	12						SPACE		
		TOTAL:	6.7	4.2										4.2		:TOTAL		
		TOTAL CONNECTED AMPS: L1: 10.8 L2: 4.2																

	CATEGORY (CT)	CONNECTED LOAD (KVA) PNL	FED THRU	TOTAL	NEC DEMAND FACTOR	NEC DEMAND LOAD (KVA)
1	LIGHTING	1.0		1.0	125%	1.3
2	RECEPTACLES	0.8		0.8	50% OVER 10 KVA	0.8
3	EQUIPMENT (CONTINUOUS)				125%	
4	EQUIPMENT (NON-CONTINUOUS)				100%	
5	MOTORS Largest Motor 2 HP				125% LRGST LOAD	0.7
6	NON-COINCIDENT				0%	
7	NO DIVERSITY				100%	
	TOTAL KVA	1.8		1.8		2.8
	NEC 215.2 MINIMUM FEEDER AMPACITY:					11.5

NOTES:
1. PROVIDE GFCI 5MA CIRCUIT BRKR

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REV	DATE	DESCRIPTION

PROJ. NO. 231585
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CHECKED LRH
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SHEET TITLE:
ELECTRICAL SCHEDULES

SHEET NO:
E-603