

MUNICIPALITY OF SKAGWAY PROJECT MANUAL

FOR

PULLEN CREEK R/V PARK RESTROOMS Skagway, Alaska

April 30, 2024



RESPEC

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END OF SECTION



MUNICIPALITY OF SKAGWAY
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(May 3, 2024)
REQUEST FOR BIDS
PULLEN CREEK R/V PARK RESTROOMS

The Municipality of Skagway is accepting bids to construct the Pullen Creek R/V Park Restrooms. The WORK covered in the Contract Documents generally includes: Demolition of the existing restroom facility, Site preparation and the installation of a wood framed restroom building with slab on grade, and other miscellaneous related WORK. All work must conform to the requirements provided in the bid documents.

BASE BID

Work includes site preparation, wood framed building, exterior and interior components, concrete ramps and landings, and miscellaneous related work at 175 Congress Way, Skagway Alaska 99840.

Bids shall include all labor, equipment, transportation, and materials to complete the specified work. Bids shall also include mobilization and demobilization to and from the Project site. Alaska Labor Standards, reporting and prevailing wage rate determination is made part of this bid package. If this project is over \$25,000, a notice of award will be sent to the Alaska Department of Labor - Wage and Hour Section. The State will require that certified payroll forms are completed, and the State has the right to randomly audit the successful bidders company to ensure Davis Bacon Wages are being paid for this project.

A full copy of the Request for Bids can be obtained by calling Skagway Municipal Offices at 907-983-2297, or by e-mailing a.lawson@skagway.org. Technical questions regarding this project must be directed in writing to the Borough Manager at manager@skagway.org and contracts@skagway.org.

Project completion schedule for the Base Bid is as follows:

PROJECT COMPLETION DATE FOR THIS WORK SHALL BE APRIL 15, 2025.

Bidders are expected to be familiar with the potential extreme and challenging weather conditions in Skagway, Alaska and the Municipality will assume all bidders have considered weather in preparing their bids and rely on all bidders having considered Skagway weather in submitting their bids. Extraordinary weather delays may be considered and addressed through contract modification in the sole discretion of the Municipality. Liquidated damages shall be a part of the final contract.

Bidders are encouraged to familiarize themselves with this project through contact with the Borough Manager and by visiting the site of the project.

The Municipality of Skagway shall not be responsible for any costs incurred in the preparation of bids. The Municipality reserves the right to reject any or all bids.

Bids must be sealed and clearly labeled with the following information:

1. "Pullen Creek R/V Park Restrooms"
2. Date and Time of Bid Due Date (May 29, 2024, 2:00 PM)
3. Bidder's name

Bids are due no later than 2:00 pm Alaska Standard time on May 29, 2024 at the address listed above or delivered directly to Municipal Offices on 700 Spring Street. All bidders are expected to consider weather in determining how to deliver their bids timely and there shall be no exceptions for a late received bid on account of weather.

Faxed and e-mailed bids will not be accepted. Bids will be opened in the Assembly Chambers at 2:00 p.m. on Date of Closing.

The Municipality of Skagway is an equal opportunity employer.

END OF SECTION

Bid Evaluation/Award: The Municipality of Skagway (Municipality) may award a contract based on bids received as a result of this Request for Bids if it is in the best interest of the Municipality. A bid award will be based on the overall bid price, but the Municipality may reject the low bid if such rejection is determined to be in the best interests of the Municipality. The Municipality reserves the right to reject any or all bids received if determined to be in the best interest of the Municipality. The Municipality reserves the right to waive minor informalities and irregularities of bids received if it is in the best interest of the Municipality.

Bid Package Fee: There is not a fee for this bid package.

Bid Security: There is no Bid Security required for this project.

Qualifications of Apparent Low Bidder: To demonstrate Bidders qualifications to perform the Work, Apparent Low Bidder shall submit the following documents within seven (7) days after posting of bid tabulation.

- written evidence establishing its qualifications such as financial data, previous experience, and present commitments, and the following information:
 - Evidence of Bidders authority to do business in the state where the project is located.
 - Bidders state or other contractor license number, if applicable.
 - Subcontractor and Supplier qualifications information.
 - Other required information regarding qualifications.
- A Bidders failure to submit required qualifications information within the times indicated may disqualify Bidder from receiving an award of the Contract.
- No requirement in this section to submit information will prejudice the right of the Owner to seek additional pertinent information regarding Bidders qualifications.
- Bidder is advised to carefully review those portions of the Bid From requiring Bidder's representations and certifications.

Project Completion: Project completion will be no later than April 15, 2025. Bidders are expected to be familiar with the potential extreme and challenging weather conditions in Skagway, Alaska and the Municipality will assume all bidders have considered weather in preparing their bids and will rely on all bidders having considered Skagway weather in submitting their bids. Extraordinary weather delays may be considered and addressed through contract modification in the sole discretion of the Municipality.

Project Description: The successful Bidder will be responsible for providing the following services:

- Bids shall include all labor, equipment, transportation, supplies and materials to complete the work as specified in this Request for Bids. Bids shall include all mobilization and demobilization to and from the Project site.
- Successful Contractor must supply all material and supplies.
- Successful Bidder/Contractor shall provide a project schedule to the Borough Manager prior to starting work.
- All work shall conform to all Federal, State, and Local laws, regulations and codes. The Successful Bidder/Contractor shall comply with the Migratory Bird Treaty Act and shall comply with the provisions of those federal laws as applicable to migratory birds, eggs, and nests in Skagway Borough.

- Successful Bidder/Contractor shall obtain any and all necessary permits from Federal, State or local authorities for this project, including payment of any applicable fees and costs associated with the permit/process.
- The Successful Bidder/Contractor's shall properly dispose of all debris and/or material at the end of each workday. Contractor may coordinate disposal with the Public Works Department.
- Before acceptance of the Project as complete, the Municipality shall inspect and verify that the work is complete. All work found unacceptable shall be redone at the Successful Bidder/Contractor's expense to the satisfaction and acceptance of the Municipality. All work determined to be incomplete shall be completed in accordance with the contract specifications.
- Alaska Labor Standards, reporting and prevailing wage rate determination is made part of this bid package. If this project is over \$25,000, a notice of award will be sent to the Alaska Department of Labor - Wage and Hour Section. The State will require that certified payroll forms are completed and the State has the right to randomly audit the successful bidders company to ensure Davis Bacon Wages are being paid for this project.

Project Site: It is the sole responsibility of the Bidder to evaluate the jobsite and make their own technical assessment of the project site for determining the proposed work process, schedule, site conditions and equipment utilization and to make a valid financial bid. The Municipality will not make any additional compensation or payments if the project conditions are different from the conditions expected, anticipated or assumed by the Bidder.

Pre-Bid Conference: A mandatory pre-bid conference will be held on **May 15, 2024, 10AM**, at the City Hall located at 700 Spring Street, Skagway, AK 99840 followed by a project site visit. All bidders are required to attend the pre-bid meeting and site visit.

Construction Standards: All work and equipment must comply with the Uniform Building Code latest version.

Project Contact: Bidders are encouraged to familiarize themselves with project requirements. All inquiries must be in writing and directed to the Borough Manager at manager@skagway.org and contracts@skagway.org.

Submittal Deadline and Location: Bidders are responsible to assure delivery prior to deadline. Only bids received prior to the date, time and received at the location specified shall be considered. Faxed or e-mailed bids will not be accepted. Bidders are fully responsible for ensuring their bids physically arrive in Skagway timely, regardless of weather.

Bids to Remain Open: Bidders shall guarantee their Bids for a period of sixty (60) calendar days from the date of the bid opening.

Beginning of Work: Physical work may begin upon the Bidder signing the Contract and the Notice of Award and the Notice to Proceed from the Municipality. Physical work at the project site shall not begin until September 1, 2024.

Liquidated Damages: The Bidder will pay the Municipality up to \$1500 per day in liquidated damages if the project is not completed in accordance with the Bid specifications. If the Municipality determines that the project is defective and that repairs must be made to meet the Bid specifications, the Bidder will pay the Municipality up to \$1,500 per day for each day which the project fails to meet the approval of the Municipality, up to the time that the Municipality agrees that the project has been completed in accordance with the Bid specifications.

Delays beyond Bidders Control: Suspension of work caused by Acts of God, which are beyond the control of the Bidder, shall not be cause for termination. If such Acts suspend work on the project, any delay caused will be negotiated and an addendum to this contract will be issued, which will be signed by both the Municipality and the Bidder, outlining the time schedule and costs associated with any delay in substantially completing the project.

Insurance & Indemnification: No contract for services shall be issued or continued unless there is presented to the Municipality of Skagway a certificate of insurance showing that the business owner/operator has obtained at least two million dollars (\$2,000,000.00) general liability insurance. Proof of such insurance shall be provided to the Municipality as a condition of entering the contract. Failure to maintain such insurance shall constitute a material breach of contract. The certificate of insurance must establish that the Municipality is named as an additional insured on such policy, and that the insurer shall notify the Municipality twenty (20) days before the policy is canceled, or terminated. Additionally, the Successful Bidder/Contractor shall execute an instrument under the terms of which the Successful Bidder/Contractor shall agree to indemnify, defend and hold harmless the Municipality of Skagway from any and all claims for injury, including death, or damage to persons or property as a result of the Successful Bidder/Contractor's activities.

Bidder shall provide Worker's Compensation Insurance in compliance with the laws of the State of Alaska, AS 23.30et seq., and federal jurisdiction where the work is being performed.

Compensation: The Municipality agrees to pay Contractor an amount not to exceed that as specified and accepted in the bid upon completion of the project.

Responder's Responsibility: Responding Bidder's have the responsibility of understanding what is required by this solicitation. The Municipality shall not be held responsible for any firm's lack of understanding. Should a firm not understand any aspect of this solicitation, or require further explanation or clarification regarding the intent or requirements of this solicitation, it shall be the responsibility of the Bidder to submit any question or questions to the Municipality. Further, by submitting a bid in response to this solicitation, a firm certifies that it has thoroughly read and understands this solicitation in its entirety.

Addenda: The Municipality will make reasonable efforts to provide Bidders with all addenda when issued. Addenda may be issued by any reasonable method such as hand delivery, mail, facsimile, and courier and in special circumstances, by phone. It is the Bidder's responsibility to ensure receipt of all addenda. No claim or protest will be allowed based on the Bidder's

allegation that the Bidder did not receive all of the addenda or did not timely received all of the addenda.

Technical Questions: All technical questions shall be directed in writing to the Borough Manager no later than at **2 pm May 21, 2024**, by email at manager@skagway.org and contracts@skagway.org.

Cost Incurred in Bid Preparation: No contract shall be in effect until the Municipality executes a written agreement. The Municipality shall not be liable for any cost incurred by any Bidder in the response to this Request for Bids, including any work done, even in good faith, prior to the execution of a contract.

Proprietary Information: Bidders shall not include proprietary information in bids if such information should not be disclosed to the public. Any language with a submittal purporting to render all or portions of a bid confidential will be disregarded. Proprietary information, which may be provided will be confidential, if expressly agreed by the Municipality, and if allowable by state law.

Minor Informalities: The Municipality reserves the right to waive any minor informality, negotiate changes or reject any and all bids and to not award the proposed contract, if it is in the Municipality's best interest. Minor informalities mean matters of form rather than substance which are evident from the submittal, or are insignificant matters that have a negligible effect on price, quantity, quality, delivery, or contractual conditions and can be waived or corrected without prejudice to other Bidders.

Receipt and Bid Opening: The Municipality must receive all bids including any amendment or withdrawal prior to the scheduled time for submitting bids. Any bid, amendment, or withdrawal, which has not been actually physically received by the Municipality prior to the scheduled time for submitting bids shall not be considered. No responsibility shall be attached to any officer, employee or agent of the Municipality for the premature opening of, or failure to open, a bid improperly delivered, addressed or identified.

Until the award of a contract, the Municipality reserves the right to reject any or all bids, to waive technicalities or to advertise for new bids without liability against the Municipality. Receipt of bids will be publicly acknowledged at the submittal deadline and location by reading the bids to any attendees at the municipal building.

Disqualification of Bidders: A Bidder may be disqualified for the following reasons:

- More than one bid for the same work from an individual, firm, or corporation under the same or different name. (A party that has quoted prices to a Bidder is not thereby disqualified from quoting prices to other Bidders or from submitting a bid directly for the project).
- Evidence of collusion among Bidders as set out in the Non-Collusion Declaration attached to the Official Bid documents.

Rejection of Bids: The Municipality reserves the right to reject any and all bids when such rejection is determined to be in the best interests of the Municipality; to reject the bid of a Bidder who has previously failed to perform properly, or complete on time, any contracts or projects; to reject the bid of an Bidder who is not, in the opinion of the Municipality and sole discretion of the Municipality, in a position to perform the contract; and to reject a bid as non-responsive where the Bidder fails to furnish the required documents, fails to complete the required documents in the manner directed, or makes unauthorized alterations to bid documents.

Non-Responsive Bids: Bids shall be considered non-responsive and shall be rejected if there are unauthorized additions, conditional or alternative bids, or irregularities of any kind which may tend to make the bid incomplete, indefinite, or ambiguous as to its meaning.

Documents for Successful Bidder: Prior to contract execution and Notice to Proceed, the successful Bidder shall complete and submit the following documents within seven (7) days following Notice of Intent to Award, as well as any other documents that may be requested by the Municipality.

- Signed Agreement
- Proof of Insurance
- Performance Bond (Specification Section 000610)
- Payment bond (Specification Section 000620)
- Copy of Subcontractor Agreements
- Copy of State and Municipal Business License
- ADEC Disadvantaged Business Enterprise (MBE and WBE) Report of Participation (Specification Section 00400) If Applicable
- ADEC DBE Contact Documentation (if bidder did not meet established goal, specification section 00400) If Applicable
- EEO Employer Information Report EEO-1 (Specification Section 00400) If Applicable
- EPA Debarment Certification (Specification Section 00412) If Applicable
- American Iron and Steel Certification (Specification Section 00410) If Applicable

Award and Execution of Contract: All Bidders will be notified of Municipality's intent to award the contract and the successful Bidder will be requested to execute certain documents that shall include a contract agreement. No contract shall be considered as effective until it has been fully executed by both parties (Bidder and Municipality).

Failure to Execute Contract: Failure of the successful Bidder to execute and return the contract agreement and other documents within seven (7) days after receipt of the Municipality's Notice of Intent to Award, will be just cause for the rejection of the award. Award may then be made to the next lowest responsive, responsible and qualified Bidder, or the work may be re-advertised, in the sole discretion of the Municipality.

If the Municipality does not execute the contract agreement within fifteen (15) days following receipt from the Bidder of all required documents appropriately executed for the award of the contract, the Bidder shall have the right to withdraw its bid without penalty.

Skagway Bidder Preference: A bid shall be awarded to a Skagway bidder if Bidder's bid is not more than five percent higher than the lowest responsive nonresident bidder's. A bid shall be rejected if it contains a material alteration or an erasure. The Municipality may reject the bid of a bidder who failed to perform or failed to timely perform on a previous contract with the Municipality or any municipality. The Borough manager may reject any and all bids and waive any informalities or minor irregularities in the bids. Where all bids are rejected, and new bids are called for on substantially the same purchase or contract, each of the bidders whose bids were rejected shall be timely notified of the new call for bids and of changes, if any, in the specifications and requirements.

Permit Responsibility: Successful Bidder/Contractor shall obtain any and all necessary permits from Federal, State and local authorities for this project, including any applicable fees and costs associated with the permit/process.

Davis Bacon: Alaska Labor Standards, reporting and prevailing wage rate determination is made part of this bid package. If this project is over \$25,000, a notice of award will be sent to the Alaska Department of Labor - Wage and Hour Section. The State will require that certified payroll forms are completed and the State has the right to randomly audit the successful bidders company to ensure Davis Bacon Wages are being paid for this project. Both State and Federal wage rates apply to this contract. Contractor must use the higher of the wage rates included in Specification Section 00420 Alaska Labor Standards Reporting, and Prevailing Wage Rate Determination.

Payment and Performance Bond: If this project is under \$50,000 no bonding is required and the bonding bid sheet does not need to be completed. If this project is over \$50,000 but under \$150,000, bidder must sign the bonding exemption checklist & have it notarized. Answers to questions on Bonding Exemption Checklist page may require bonding papers or a letter from bonding company saying contractor is bondable for this project for the amount of the project. If this project is over \$150,000, bonding **IS** required. For purposes of bid documents, a signed letter from a surety company committing to the bonding of the contractor in the amount of the project will suffice until the time of actual signing of the contract, when bond must be on hand. (See Bonding Exempt Checklist)

Ownership of Bid Submittals: Once bids are opened, they become the property of the Municipality, and shall not be returned. Bids may be withdrawn by submitting a written withdrawal request to the same address to which the bid was submitted if said request is received by the Municipality one (1) hour prior to the bid opening time and date. The bid shall be returned to the Bidder unopened.

Bid Form: Bids will be considered non-responsive if the following documents are not completely filled out and submitted at the time of bidding:

- Completed Official Bid Form
- Bid Modification Form (if applicable)
- Bid Schedule, Section 000310
- Contracting Officer Documentation
- Non-Collusion Declaration
- Bonding Exempt Checklist (with additional bonding paperwork if required)
- Bid Bond

END OF SECTION

REQUEST FOR BIDS – BID FORM

(Contractor's name below)

_____ agrees to provide all labor, equipment, transportation, materials and mobilization and demobilization to and from the work site to complete the Project as described in the Request for Bids dated and in any bid addenda for the total lump sum of:

\$ _____
(Numeric Dollar Amount)

\$ _____
(Written Dollar Amount)

ACKNOWLEDGEMENT OF ADDENDUMS

The bidder acknowledges receipt of addendums to the solicitation (give number and date of each)

ADDENDUM#				
DATE				

Bidder is required to list all subcontractors that will be utilized for this project: (Additional sheets listing subcontractors may be attached if needed and must be signed by Bidder)

- 1.
- 2.
- 3.

Bid Representative Signature: _____

Printed Name: _____

Contractor Name: _____

Contractor Address: _____

Date: _____

Contractor's Alaska License Number: _____

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PROJECT BID							
Item No.	Pay Item Description	Pay Unit	Approximate Quantity	Unit Price		Amount	
				Dollars	Cents	Dollars	Cents
Division 00	General Conditions	Lump Sum	All Req'd				
Division 01A	General Contractor Requirements	Lump Sum	All Req'd				
Division 01B	Mobilization	Lump Sum	All Req'd				
Division 01C	Final Cleanup & Site Restoration, Close Out Documents and Demobilization for All Disciplines	Lump Sum	All Req'd				
Division 02	Selective Demolition	Lump Sum	All Req'd				
Division 03	Cast in Place Concrete	Lump Sum	All Req'd				
Division 06A	Rough Carpentry	Lump Sum	All Req'd				
Division 06B	Sheathing	Lump Sum	All Req'd				
Division 06C	Roof Trusses	Lump Sum	All Req'd				
Division 07	Thermal and Moisture Protection	Lump Sum	All Req'd				
Division 08	Openings	Lump Sum	All Req'd				
Division 09	Finishes	Lump Sum	All Req'd				
Division 10	Specialties	Lump Sum	All Req'd				
Division 22	Mechanical Plumbing	Lump Sum	All Req'd				
Division 23	Mechanical HVAC	Lump Sum	All Req'd				
Division 26	General Electrical	Lump Sum	All Req'd				
Division 31	Earthwork	Lump Sum	All Req'd				
Division 32	Site Improvements	Lump Sum	All Req'd				
Division 33	Utilities	Lump Sum	All Req'd				

PROJECT BID TOTAL = \$ _____

Each Bid Schedule Line Item lump sum cost shall be accurately all inclusive for that specific Division of Work item.

COMPANY NAME: _____

KNOW ALL PERSONS BY THESE PRESENTS, that _____
_____ as Principal, and _____
As Surety, are held and firmly bound unto **THE MUNICIPALITY OF SKAGWAY** hereinafter called
“OWNER”, in the sum of _____
_____ dollars, (not less than five percent of the total amount of the Bid) for the
payment of which sum, well and truly to be made, we bind ourselves, our heirs, executors, administrators,
successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, said Principal has submitted a Bid to said OWNER to perform the WORK required
under the Bid Schedule of the OWNER’s Contract documents entitled:

Pullen Creek R/V Park Restrooms

NOW THEREFORE, if said Principal is awarded a Contract by said OWNER and, within the time
and in the manner required in the “Notice Inviting Bids” enters into a written Agreement on the form of
Agreement bound with said contract documents, furnishes the required certificates of insurance, and furnishes
the required Performance Bond and Payment Bond, then this obligation shall be null and void, otherwise it
shall remain in full force and effect. In the event suit is brought upon this bond by said OWNER and
OWNER prevails, said Surety shall pay all costs incurred by said OWNER in such suit, including a
reasonable attorney’s fee to be fixed by the court.

SIGNED AND SEALED, this _____ day of _____, 2024

(SEAL) _____
(Principal)

(SEAL) _____
(Surety)

By: _____
(Signature)

By: _____
(Signature)

END OF SECTION

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LIST OF SUBCONTRACTORS

The apparent low Bidder must submit a list of Subcontractors and copy of the Subcontractor's required documents (licenses, insurance, permits, and other required documents) that the Bidder proposes to use in the performance of this Contract by close of business on the seventh calendar day following the Notice of Intent to Award. If the fifth calendar day falls on a weekend or holiday, the report is due by close of business on the day following the weekend or holiday. The list must include each Subcontractor's name, address, location, evidence of valid Alaska Business License, and valid Alaska Contractors Registration under AS 08.18. *If no Subcontractors are to be utilized in the performance of the WORK, write in ink or type "NONE" on line (1) below.*

<u>SUBCONTRACTOR*</u>	¹ AK Contractor <u>License No.</u>	¹ Contact Name	<u>Type of</u>	<u>Contract</u>	✓ if
<u>ADDRESS</u>	² AK Business <u>License No.</u>	² Phone No.	<u>Work</u>	<u>Amount</u>	<u>DBE</u>
1. _____ _____ _____	1 _____ 2 _____	_____ _____	_____ _____	\$ _____	<input type="checkbox"/>
2. _____ _____ _____	1 _____ 2 _____	_____ _____	_____ _____	\$ _____	<input type="checkbox"/>
3. _____ _____ _____	1 _____ 2 _____	_____ _____	_____ _____	\$ _____	<input type="checkbox"/>
4. _____ _____ _____	1 _____ 2 _____	_____ _____	_____ _____	\$ _____	<input type="checkbox"/>

* Include Disadvantaged Business Enterprise (DBE) Subcontractors (attach additional sheets as necessary).

I certify that the above listed Alaska Business License(s) and CONTRACTOR Registration(s), if applicable, were valid at the time Bids were opened for this project.

 CONTRACTOR, Authorized Signature

 CONTRACTOR, Printed Name

- A. A Bidder may replace a listed Subcontractor if the Subcontractor:
1. fails to comply with AS 08.18;
 2. files for bankruptcy or becomes insolvent;
 3. fails to execute a Contract with the Bidder involving performance of the WORK for which the Subcontractor was listed and the Bidder acted in good faith;
 4. fails to obtain bonding;
 5. fails to obtain insurance as required in the Contract with the Contractor and in an amount not less than \$2,000,000 for general liability;
 6. fails to perform the Contract with the Bidder involving work for which the Subcontractor was listed;
 7. must be substituted in order for the CONTRACTOR to satisfy required state and federal affirmative action requirements;
 8. refuses to agree or abide with the Bidder's labor agreement; or
 9. is determined by the OWNER not to be a responsible subcontractor.
- B. If a Bidder fails to list a Subcontractor or lists more than one Subcontractor for the same portion of WORK, the Bidder shall be considered to have agreed to perform that portion of WORK without the use of a Subcontractor and to have represented the Bidder to be qualified to perform that WORK.
- C. A Bidder who attempts to circumvent the requirements of this section by listing as a Subcontractor another contractor who, in turn, sublets the majority of the WORK required under the Contract violates this section.
- D. If a Contract is awarded to a Bidder who violates this section, the OWNER may:
1. cancel the Contract without penalty or cost to the OWNER; or
 2. assess against the Bidder a penalty in an amount that does not exceed 10 percent of the value of the subcontract at issue, provided the Bidder is given written notice of the assessment and the opportunity for an appeal before the assessment is imposed.
- E. For Contract award, the apparent low Bidder must submit one copy of each subcontract, to the OWNER, for WORK with a value of greater than one half of one percent of the intended award amount.
- F. An apparent low Bidder who fails to submit a completed Subcontractor Report within the time specified in this section will be found to be not a responsible Bidder and may be required to forfeit the Bid security. The OWNER will then consider the next lowest Bidder for award of the Contract.

Contracting Officer Document

(Project Name)

Company Name

Company Address (Street or P.O. Box, City, State, Zip)

**TO THE BOROUGH MANAGER
MUNICIPALITY OF SKAGWAY**

In compliance with your Request for Bids dated, _____, the Undersigned proposes to furnish and deliver all the materials, supplies and equipment, including mobilization and demonization, and do all the work and labor required in the construction of the above referenced Project, located at or near **Skagway, Alaska**, according to the plans and specifications and for the amount and prices named herein as indicated on the Project Bid Form consisting of **1** sheet, which is made a part of this Bid.

The Undersigned declares that he has carefully examined the contract requirements and that he has made a personal examination of the site of the work; that he understands that the quantities, where such are specified in the Project Bid Form or on the plans for this project, are approximate only and subject to increase or decrease, and that he is willing to perform increased or decreased quantities of work at unit prices bid under the conditions set forth in the Contract Documents.

The Undersigned hereby agrees to execute the contract within 7 calendar days or such further time as may be allowed in writing by the Borough Manager, after receiving notification of the acceptance of this bid, and it is hereby mutually understood and agreed that in the case the Undersigned does not, the accompanying bid security shall be forfeited to the Municipality of Skagway as liquidated damages, and the Borough Manager may proceed to award the contract to others.

Signature: _____

THIS IS TO CERTIFY that on this _____ day of _____, 20____, _____
_____ personally appeared before me, to me
known to be the individual described in and who executed the within Bid Form for the Municipality of
Skagway and acknowledged that he signed the same as his free and voluntary act and deed, for the uses
and purposes therein mentioned.

GIVEN UNDER MY HAND and official seal the day and year last above
written.

Notary Public in and for Alaska
My commission expires: _____

NON-COLLUSION DECLARATION FOR MUNICIPALITY OF SKAGWAY

The undersigned declares, under penalty of perjury under the laws of the United States, that neither he nor the firm, association, or corporation of which he is a member, has, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with this bid.

The undersigned has read the foregoing and hereby agrees to the conditions stated therein by affixing his signature below:

Signature of Authorized Company representative

Typed name and Title of Authorized Company Representative

Phone Number

Fax Number

THIS IS TO CERTIFY that on this _____ day of _____, 20____, _____
_____ personally appeared before me, to me known to be the individual described in and who executed the within Non-Collusion Declaration for the Municipality of Skagway and acknowledged that he signed the same as his free and voluntary act and deed, for the uses and purposes therein mentioned.

GIVEN UNDER MY HAND and official seal the day and year last above written.

Notary Public in and for Alaska
My commission expires:_____

BONDING EXEMPTION CHECKLIST – MUNICIPALITY OF SKAGWAY

Contractors are exempt from payment, performance and material bonding requirements for projects over \$50,000 and not exceeding \$150,000 if the following conditions apply. Please complete this section entirely.

1. Has Contractor been licensed in the State of Alaska for **at least** two (2) years? Please provide documentation. (If answer is no to this question and no documentation is provided, then a letter from your bonding company stating you are bondable for this project is required, or provide a letter from a responsible bank in the United States stating that you have enough money to set up an escrow account in the name of the Municipality to equal the value of the contract.)
 Yes No
2. Has Contractor defaulted on a contract during the last three (3) years? (If answer is yes to this question, a letter from your bonding company stating you are bondable for this project is required, or provide a letter from a responsible bank in the United States stating that you have enough money to set up an escrow account in the name of the Municipality to equal the value of the contract.)
 Yes No
3. Please attach a financial statement prepared within the last nine (9) months, certified by a public accountant, demonstrating that the contractor has a net worth of not less than twenty percent (20%) of the amount of the contract. Bidder must place their financial information in a sealed envelope marked “Financial Information, Proprietary”. All financial paperwork will remain confidential. Is financial statement attached? (If answer is no to this question, a letter from your bonding company stating you are bondable for this project is required, or provide a letter from a responsible bank in the United States stating that you have enough money to set up an escrow account in the name of the Municipality to equal the value of the contract.)
 Yes No
4. Does the total amount of **all** contracts which contractor anticipates performing during the contract period exceed your net worth by more than seven (7) times? Please provide documentation. (If answer is yes to this question or no documentation provided, then a letter from your bonding company stating you are bondable for this project is required, or provide a letter from a responsible bank in the United States stating that you have enough money to set up an escrow account in the name of the Municipality to equal the value of the contract.)
 Yes No
5. Is letter from bonding company or bank provided?
 Yes No

Signature: _____

THIS IS TO CERTIFY that on this _____ day of _____, 20____, _____ personally appeared before me, to me known to be the individual described in and who executed the within the Bonding Exemption Checklist for the Municipality of Skagway and acknowledged that he signed the same as his free and voluntary act and deed, for the uses and purposes therein mentioned.

GIVEN UNDER MY HAND and official seal the day and year last above written.

Notary Public in and for Alaska
My commission expires: _____

END OF SECTION

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State of Alaska, Department of Labor, Laborers' and Mechanics' Minimum Rates of Pay, AS 36.05.010 and AS 36.05.050, Wage and Hour Administration Pamphlet No. 600 Effective September 1, 2023 Issue 39 follow this page and is made a part of this specification section and this contract by reference. The Published Davis Bacon Wage Rates Dated August 23, 2023 are made a part of this specification section and this contract by reference along with the Davis Bacon Requirements (19 pages) contained in this specification section.

The CONTRACTOR is responsible for contacting the Alaska Department of Labor to determine compliance with current regulations. Both state and federal wage rates apply and the highest rate shall be used.

Required Reporting During Contract (to be provided by every CONTRACTOR and Subcontractor):

- A. **Certified Payrolls must be submitted every week. Before Friday**, each CONTRACTOR and Subcontractor must file Certified Payrolls with Statements of Compliance for the previous week. If there was no activity for that pay period, indicate "**No Activity**." Indicate "**Start**" on your first payroll, and "**Final**" on your last payroll for this Project. Send to:

Wage and Hour Section
Alaska Department of Labor and Workforce Development
Labor Standards and Safety Division
Wage and Hour Administration and
P.O. Box 21149
Juneau, AK 99802-1449
907-465-4842

Borough Clerk
Municipality of Skagway
P.O. Box 415
Skagway, AK 99840
(907) 983-2297

- B. **Within 10 Days of "Notice of Award/Notice to Proceed"** make a list of **all** Subcontractors. Include their name, address, phone, estimated subcontract amount, and estimated start and finish dates. Send to:

Borough Clerk
Municipality of
Skagway
P.O. Box 415 and
Skagway, AK 99840
(907) 983-2297

Wage and Hour Section
State of Alaska
Department of Labor and Workforce
Development
Labor Standards and Safety Division
Wage and Hour
Administration
P.O. Box 21149
Juneau, AK 99802-1449

- C. As part of the **final payment request package**:

A completed Compliance Certificate and Release form (provided in Section 01700 - Project Closeout) from every CONTRACTOR.

A final Subcontractor list complete with final subcontract amounts and including all equipment rentals (with operators).

Tax Clearance letters from the Alaska Department of Labor (provided in Section 00800 Supplementary General Conditions).

END OF SECTION



MUNICIPALITY OF SKAGWAY
GATEWAY TO THE KLONDIKE
P.O. BOX 415, SKAGWAY, ALASKA 99840
(PHONE) (907) 983-2297
(FAX) (907) 983-2151
www.skagway.org

/ATTACHMENT A

AN AGREEMENT BETWEEN

AND THE MUNICIPALITY OF SKAGWAY

This agreement is made and entered into this DATE between (CONTRACTOR name) (hereinafter referred to as CONTRACTOR) and the MUNICIPALITY of Skagway (hereinafter referred to as MUNICIPALITY) for the purpose of (named project). By signature on this agreement the parties agree to the following terms and conditions:

I. SCOPE OF WORK:

- A. CONTRACTOR shall perform services as directed by the MUNICIPALITY of Skagway for (project), per the request for bids (Attachment A) and CONTRACTORS bid submitted on (date) (Attachment B). CONTRACTOR shall follow the Bid Documents and Plans that were part of the advertised RFB and all general conditions, special conditions, and addendum, including all questions by bidders and responses.
- B. The CONTRACTOR, for and in consideration of the payment or payments herein specified and agreed to by MOS, hereby covenants and agrees to furnish all labor, equipment, transportation, mobilization and demobilization, and materials required to complete the project at Skagway, Alaska in accordance with the terms and conditions of the RFB Titled Pullen Creek R/V Park Restrooms.

II. COMPENSATION AND DURATION

- A. CONTRACTOR has submitted a bid in the amount of \$(0.00) (Dollar amount written out) to perform the work as outlined and described in the, RFB, CONTRACTORS submitted bid, and the scope of work described above. The MUNICIPALITY agrees to pay CONTRACTOR an amount not to exceed that as specified and accepted in the bid proposal upon completion of the project. The MUNICIPALITY must receive payment requests no later than 4-business days prior to scheduled finance meetings of the Assembly finance committee. CONTRACTOR shall submit an invoice on the 1st of each month. The payments will not necessarily fall on the 1st of each month, but will follow the Assembly check run approval process (on the 1st and 3rd Thursday of each month).
- B. The parties expressly agree that CONTRACTOR shall be and is an independent CONTRACTOR and is not an employee or agent of MUNICIPALITY, and is, therefore, entitled to no insurance coverage, whether workers' compensation or otherwise and no other benefits accorded to MUNICIPALITY. No withholding, FICA, or other taxes (whether income, sales or otherwise) or other amounts will be withheld from the payments due to

- CONTRACTOR, it being understood that CONTRACTOR is solely responsible therefore, provided MUNICIPALITY shall be entitled to withhold certain amounts from any payments as have been provided for elsewhere in this Agreement.
- C. The CONTRACTOR agrees to receive the total amount as set forth in the RFB and the Schedule of Values as full compensation for furnishing all the equipment, materials, transportation, mobilization and demobilization and labor which may be required in the performance and completion of the whole work to be done under this Contract, and in all respects to complete the Contract to the satisfaction of MUNICIPALITY.
 - D. CONTRACTOR shall have all work completed **no later than April 15 2025**.
 - E. The parties acknowledge the time period for this performance may be impacted by the various emergency measures related to COVID-19 and the parties agree to mutually cooperate to make the necessary adjustments for the time of performance to comply with the state and local health and safety measures.

III. MUNICIPALITY'S RESPONSIBILITY

- A. MUNICIPALITY shall designate a person to act as the MUNICIPALITY'S representative with respect to the services to be rendered under this agreement. This representative shall have complete authority to transmit instructions, receive information, interpret and define the MUNICIPALITY'S policies and decisions with respect to the CONTRACTOR'S services. Designation of a Municipal representative shall not change any of the CONTRACTOR'S obligations and responsibilities under this Contract. CONTRACTOR shall remain responsible and liable for all acts and omissions related to the CONTRACTOR's means and methods of performing the work.

IV. CONTRACTOR'S RESPONSIBILITIES

- A. CONTRACTOR shall provide a representative for the project who shall have complete authority to transmit instructions, receive information, interpret and define the CONTRACTOR'S policies and decisions with respect to the project. This provision is a material provision of the contract and the failure of the CONTRACTOR to have an available representative may result in the Municipality terminating the contract for this breach, stopping all or part of the project until the CONTRACTOR fully complies with this provision, or any other remedy or action the Municipality determines to be in the best interests of the project and Municipality.
- B. CONTRACTOR agrees that all work will meet all federal, state and local laws, and will be of the highest quality workmanship. CONTRACTOR agrees that all material and labor shall be in strict and entire conformity with the terms, specifications and conditions of the RFB, and will abide by and perform all stipulations, covenants and agreements specified in the RFB. The CONTRACTOR shall comply with the Migratory Bird Treaty Act and shall comply with the provisions of those federal laws as applicable to migratory birds, eggs, and nests in Skagway Borough
- C. If any equipment, material or labor shall be rejected by MUNICIPALITY as defective or unsuitable, the equipment, labor or materials shall be removed or replaced with other equipment, labor or materials specified by MUNICIPALITY, at the sole cost and expense of the CONTRACTOR.

- D. CONTRACTOR shall not begin work on any additional services, which are not included in the Agreement as provided for the RFB until the MUNICIPALITY has authorized performance of such services in writing specifying the work to be performed and the time for performance. CONTRACTOR shall provide the MUNICIPALITY with a bid estimate of the costs of the additional work and it is agreed both the CONTRACTOR and the MUNICIPALITY shall sign an addendum to this Agreement prior to any additional work for the amount to be paid to the CONTRACTOR for the additional work. CONTRACTOR agrees and acknowledges that no oral authorization for additional work will be honored or paid.
- E. CONTRACTOR covenants, warrants and represents that CONTRACTOR has no interest and shall not acquire any interest, direct or indirect, which would conflict in any manner with the subject matter or the performance of this Agreement. CONTRACTOR further covenants, warrants and represents that in the performance of this Agreement, no person having any such interest shall be employed.
- F. CONTRACTOR shall comply with all federal, state and local mandates and protocols related to COVID-19 and CONTRACTOR shall insure that all employees, subcontractors, consultants, and invitees of CONTRACTOR shall similarly comply with all such mandates and protocols. CONTRACTOR shall have in place such procedures and protocols requiring employees, subcontractors and employees of subcontractors to immediately report any COVID-19 symptoms and take immediate steps for testing and the protection of other employees and the public.

V: INSURANCE AND INDEMNIFICATION

- A. CONTRACTOR shall present to the MUNICIPALITY a certificate of insurance showing that the CONTRACTOR has obtained at least two million dollars (\$2,000,000.00) general liability insurance, which certificate of insurance shall name the MUNICIPALITY of Skagway as an additional insured. Proof of such insurance shall be provided to the MUNICIPALITY as a condition of entering the contract. Failure to provide the certificate of insurance as required by this provision at the time of signing the contract shall constitute a material breach by the CONTRACTOR and the MUNICIPALITY may choose not to proceed with the CONTRACTOR in its sole discretion. Failure to maintain such insurance shall constitute a material breach of contract and entitle the MUNICIPALITY to terminate the CONTRACTOR and this Agreement in its sole discretion. The certificate of insurance must establish that the MUNICIPALITY is named as an additional insured on such policy, and that the insurer thereof shall notify the MUNICIPALITY twenty (20) days before the policy is canceled or terminated. The CONTRACTOR shall indemnify, defend and hold harmless the MUNICIPALITY of Skagway from any and all claims for injury or damage to persons or property, including death, arising out of or relating to the CONTRACTOR'S acts or omissions. CONTRACTOR'S insurance coverage shall apply to any coverage carried by the MUNICIPALITY which may cover the work specified in this Agreement. CONTRACTOR'S insurance carrier must be an admitted carrier in the State of Alaska or must be Best Rated or better. "CONTRACTOR" shall be defined to include CONTRACTOR'S employees, subcontractors, consultants, representatives, and invitees for purposes of the defend and indemnification provisions of this Paragraph. CONTRACTOR shall provide the Municipality with a certificate of insurance showing the Municipality as an additional insured in an amount not less than \$2,000,000, from each subcontractor on the Project.

- B. Worker's Compensation Insurance is required in compliance with the laws of the State of Alaska, AS 23.30 et seq., and federal jurisdiction where the work is being performed.
- C. Contractors' Pollution Liability – \$2,000,000 each claim and in the aggregate.

VI: TERMINATION AND SUSPENSION

- A. **TERMINATION FOR CONVENIENCE:** The Municipality reserves the right to terminate the services of the CONTRACTOR at any time when the Municipality determines that termination is in the best interests of the Municipality. If the Municipality terminates the contract pursuant to this section, the Municipality shall notify the CONTRACTOR in writing as of the effective date to stop work and the CONTRACTOR shall immediately stop all work, including providing direction to subcontractors to stop and to cease from ordering any materials or supplies for the Project. Upon termination pursuant to this section, CONTRACTOR shall have sixty (60) days to submit any and all claims to the Municipality for any unpaid work actually performed by the CONTRACTOR before the date of termination and for which the CONTRACTOR has not been paid, together with all back-up documentation in support of the claim. "Unpaid work" is defined as actual work performed in accordance with the specifications and project schedule and "unpaid work" is specifically not to include the costs of the work to the CONTRACTOR. The failure of the CONTRACTOR to submit a claim within 60 days forever waives any claim by the CONTRACTOR based upon the Municipality's termination for any payment for work claimed by the CONTRACTOR to have not been paid as of the date of termination. CONTRACTOR and the Municipality agree to make a good faith effort to resolve any claim submitted by the CONTRACTOR pursuant to this section within thirty days (30) of receipt by the Municipality, unless that time is otherwise extended by the parties in writing. If the parties fail to reach an agreement on payment to the CONTRACTOR within the 30 days, the Municipality shall pay the amount determined by the Municipality to be fair and reasonable, based on the back-up documents provided by the CONTRACTOR and the Municipality's records. In the event the parties do not reach agreement, the CONTRACTOR may pursue its remedies pursuant to Section IX (k) below unless the CONTRACTOR failed to submit the claim within 60 days of termination.
- B. **SUSPENSION OF WORK:** Suspension of work caused by Acts of God, which are beyond the control of the CONTRACTOR, shall not be cause for termination. If such Acts suspend work on the project, any delay caused will be negotiated and an addendum to this contract will be issued, which will be signed by both the MUNICIPALITY and the CONTRACTOR, outlining the time schedule and costs associated with any delay in substantially completing the project. Emergency measures mandated by the Federal government, Governor of Alaska, or the Municipality of Skagway related to COVID-19 shall not be considered Acts of God under this provision.

VII: LIQUIDATED DAMAGE

- A. The CONTRACTOR agrees that if the project is not completed in accordance with the Proposal specification and this Agreement, the CONTRACTOR shall be liable to the MUNICIPALITY for the following:
- 1) The CONTRACTOR will forfeit all payments outstanding under the Bid Proposal.
 - 2) The CONTRACTOR will pay the MUNICIPALITY up to \$1,500 per day as liquidated damages if the project is not completed in accordance with the Proposal specifications. If the MUNICIPALITY determines that the project is defective and that repairs must be made to meet the Proposal specifications, the CONTRACTOR will pay the MUNICIPALITY up to \$1,500 per day for each day that the project fails to meet the approval of the MUNICIPALITY, up to the time that the MUNICIPALITY agrees that the project has been completed in accordance with the Proposal specifications. If there are any certifications or permits necessary for acceptance of the project, the project shall not be determined complete until the CONTRACTOR has secured all such certifications or permits and liquidated damages shall continue to accrue.

VIII: EQUAL EMPLOYMENT OPPORTUNITY.

- A. The CONTRACTOR will not discriminate against any employee or applicant for employment in violation of law, to include without limitation, because of race, color, religion, sex, national origin, physical handicap, age, or status as a disabled veteran. The CONTRACTOR shall take affirmative action to ensure that applicants are employed and the employees are treated during employment without regard to their race, color, religion, sect, national origin, physical handicap, age, or status as a disabled veteran. Such actions shall include, but not be limited to the following: Employment, upgrading, demotions, or transfers; recruitment or recruitment advertising; layoff or terminations; rates of pay or other forms of compensation; selection for training, including apprenticeship; and participation in recreational and educational activities. The CONTRACTOR agrees to post in conspicuous places in his/her places of work available for employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause. 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, national origin, physical handicap, age, status as a disabled veteran. The CONTRACTOR will cause the foregoing provisions to be inserted in all subcontracts for any work covered by this Agreement.

IX: MISCELLANEOUS

- A. Written notice shall be provided to the parties, by certified mail, return receipt requested, at the following addresses:

Municipality	Municipality of Skagway PO Box 415 Skagway, AK 99840 Attn: Brad Ryan, Borough Manager
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Contractor	(Contractor Information)
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- B. CONTRACTOR agrees that the MUNICIPALITY shall have the right to inspect any or all of the project and any books, papers, records, and/or accounts of records of the CONTRACTOR at any reasonable time. All original books, papers, records and accounts related to this project shall be maintained for a minimum of three years after the completion of the project.
- C. This Agreement is binding upon the heirs, successors and assign of the parties.
- D. This Agreement cannot be assigned without prior written consent of the other party. This provision is a material provision of the contract and the assignment by the CONTRACTOR without prior written approval of the Municipality may result in the Municipality terminating the contract for this breach, stopping all or part of the project until the CONTRACTOR fully complies with this provision, or any other remedy or action the Municipality determines to be in the best interests of the project and Municipality, all in the sole discretion of the Municipality. The Municipality will not consent to any assignment to a LLC without a personal guarantee by the CONTRACTOR or a guarantee by at all of the members of the LLC.
- E. This Agreement represents the entire Agreement of the parties and no other Agreement whether oral or written which is not specifically set forth in this Agreement or an addendum to this Agreement will have any force or effect upon the other party.
- F. This Agreement can be modified if agreed to by both parties in writing. Any modification will address any changes in cost and will be agreed to in writing prior by both parties. Any modification to the bid proposal or price done without the written consent of the MUNICIPALITY by the CONTRACTOR shall be void for which the Municipality shall have no liability or obligation to pay. CONTRACTOR agrees and acknowledges that no employee nor the borough manager, nor the mayor, nor any assembly member nor any representative of the Municipality has any actual or apparent authority to orally modify or change any of the terms of this contract.
- G. CONTRACTOR's or the MUNICIPALITY'S waiver of any term or condition in this Agreement shall not constitute a waiver of any other term or condition in this Agreement.
- H. If any term of this Agreement is held to be invalid, void or unenforceable by a court of competent jurisdiction, the remaining provisions of this Agreement shall be valid and binding upon the parties.
- I. The CONTRACTOR agrees to abide by all federal, state and local laws, ordinances and regulations in the performance of the project.

- J.** Titles and headings to sections are inserted for convenience of reference only and are not intended to be a part of or to affect the meaning or interpretation of this Agreement.
- K.** The Superior Court for the State of Alaska, First Judicial District at Juneau, Alaska shall be the exclusive jurisdiction for any action of any kind and any nature arising out of or related to this Agreement or arising out of or relating to the performance of this Agreement. CONTRACTOR agrees that venue for trial in any action shall be in Skagway, Alaska. The laws of the State of Alaska shall govern the rights and obligations of the parties. The CONTRACTOR specifically waives any right or opportunity to request a change of venue for trial pursuant to A.S. 22.10.040.

The CONTRACTOR acknowledges that the CONTRACTOR has read and understands the terms of this Agreement and has had the opportunity to review the Agreement with counsel of his/her choice, and is executing this Agreement of his/her own free will. CONTRACTOR acknowledges and agrees that CONTRACTOR is not relying on any representations by any Municipal employee, the Mayor, an assembly member, the borough attorney, the borough manager or any consultant of the MUNICIPALITY in deciding to enter this Agreement and perform this project.

The term of the agreement is the period of time from the date this Agreement is made and entered into, to the time at which CONTRACTOR fulfills its obligations under this Agreement. CONTRACTOR warrants and represents that the person who executes and signs this Agreement on behalf of the CONTRACTOR is lawfully authorized to execute and sign the Agreement, and to bind CONTRACTOR to the terms and conditions of the Agreement and the RFB.

Sam Bass, Mayor
For the Municipality of Skagway

Contractor
For (Company)

Date _____

Date _____

ATTEST:

Steve Burnham, Borough Clerk

(SEAL)

END OF SECTION

KNOW ALL PERSONS BY THESE PRESENTS: That we _____
(Name of Contractor)

_____ a _____
(Corporation, Partnership, Individual)

hereinafter called "Principal" and _____
(Surety)

of _____, State of _____ hereinafter called the "Surety," are held and

firmly bound to the MUNICIPALITY OF SKAGWAY, ALASKA hereinafter called "OWNER,"
(Owner) (City and State)

for the penal sum of _____

_____ dollars (\$ _____) in lawful money of the
United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs,
executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal has, or is about to,
enter into a certain Contract with the OWNER, a copy of which is hereto attached and made a part hereof for
the construction of:

**MUNICIPALITY OF SKAGWAY
PULLEN CREEK R/V PARK RESTROOMS**

NOW, THEREFORE, if the Principal shall truly and faithfully perform its duties, all the
undertakings, covenants, terms, conditions, and agreements of said Contract during the original term thereof,
and any extensions thereof, which may be granted by the OWNER, with or without notice to the Surety, and
if it shall satisfy all claims and demands incurred under such Contract, and shall fully indemnify and save
harmless the OWNER from all costs and damages which it may suffer by reason of failure to do so, and shall
reimburse and repay the OWNER all outlay and expense which the OWNER may incur in making good any
default, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety, for value received hereby stipulates and agrees that no
change, extension of time, alteration or addition to the terms of the Contract or to the work to be performed
thereunder or the specifications accompanying the same shall in any wise affect its obligation on this bond,
and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of
the Contract or to the work or to the specifications.

PROVIDED, FURTHER, that no final settlement between the OWNER and the Principal shall
abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

**MUNICIPALITY OF SKAGWAY
PULLEN CREEK R/V PARK RESTROOMS**

IN WITNESS WHEREOF, this instrument is executed in two (2) counterparts, each one of which shall be deemed an original. The executed date of this Performance Bond is the date of the last signature below.

CONTRACTOR:

By: _____
(Signature)

Date: _____

(Printed Name)

(Company Name)

(Street or P.O. Box)

(City, State, Zip Code)

SURETY:

By: _____
(Signature of Attorney-in-Fact)

Date: _____

(Printed Name)

(Company Name)

(Street or P.O. Box)

(City, State, Zip Code)

(Affix SURETY'S SEAL)

NOTE: If CONTRACTOR is Partnership, all Partners must execute bond.

END OF SECTION

KNOW ALL PERSONS BY THESE PRESENTS: That we _____
(Name of Contractor)
_____ a _____
(Corporation, Partnership, Individual)

hereinafter called "Principal" and _____
(Surety)
of _____, State of _____ hereinafter called the "Surety," are held and
firmly bound to the MUNICIPALITY OF SKAGWAY, ALASKA hereinafter called "OWNER,"
(Owner) (City and State)
for the penal sum of _____

_____ dollars (\$ _____) in lawful money of the
United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs,
executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal has, or is about to,
enter into a certain Contract with the OWNER, a copy of which is hereto attached and made a part hereof for
the construction of:

**MUNICIPALITY OF SKAGWAY
PULLEN CREEK R/V PARK RESTROOMS**

NOW, THEREFORE, if the Principal shall promptly make payment to all persons, firms,
subcontractors, and corporations furnishing materials for, or performing labor in the prosecution of the work
provided for in such Contract, and any authorized extension or modification thereof, including all amounts
due for materials, lubricants, oil, gasoline, coal and coke, repairs on machinery, equipment and tools,
consumed or used in connection with the construction of such work, and all insurance premiums on said
work, and for all labor performed in such work, whether by subcontractor or otherwise, then this obligation
shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety, for value received hereby stipulates and agrees that no
change, extension of time, alteration or addition to the terms of the Contract or to the work to be performed
thereunder or the specifications accompanying the same shall in any wise affect its obligation on this bond,
and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of
the Contract or to the work or to the specifications.

PROVIDED, FURTHER, that no final settlement between the OWNER and the Principal shall
abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

**MUNICIPALITY OF SKAGWAY
PULLEN CREEK R/V PARK RESTROOMS**

IN WITNESS WHEREOF, this instrument is executed in two (2) counterparts, each one of which shall be deemed an original. The executed date of this Payment Bond is the date of the last signature below.

CONTRACTOR:

By: _____
(Signature)

Date: _____

(Printed Name)

(Company Name)

(Street or P.O. Box)

(City, State, Zip Code)

SURETY:

By: _____
(Signature of Attorney-in-Fact)

Date: _____

(Printed Name)

(Company Name)

(Street or P.O. Box)

(City, State, Zip Code)

(Affix SURETY'S SEAL)

NOTE: If CONTRACTOR is Partnership, all Partners must execute bond.

END OF SECTION

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ARTICLE 1 DEFINITIONS

Wherever used in these General Conditions or in the other Contract Documents the following terms have the meanings indicated which are applicable to both the singular and plural thereof. Where an entire word is capitalized in the definitions and is found not capitalized in the Contract Documents it has the ordinary dictionary definition.

Addenda - Written or graphic instruments issued prior to the opening of Bids which make additions, deletions, or revisions to the Contract Documents.

Agreement - The written contract between the OWNER and the CONTRACTOR covering the WORK to be performed; other documents are attached to the Agreement and made a part thereof as provided therein.

Application for Payment - The form furnished by the OWNER'S REPRESENTATIVE which is to be used by the CONTRACTOR to request progress or final payment and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

Asbestos - Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

Bid - The offer or proposal of the Bidder submitted on the prescribed form setting forth the price or prices for the WORK.

Bonds - Bid, Performance, and Payment Bonds and other instruments which protect against loss due to inability or refusal of the CONTRACTOR to perform its Contract.

Change Order - A document recommended by the OWNER'S REPRESENTATIVE, which is signed by the CONTRACTOR and the OWNER and authorizes an addition, deletion, or revision in the WORK, or an adjustment in the Contract Price or the Contract Time, issued on or after the Effective Date of the Agreement.

Contract Documents - The Notice Inviting Bids, Instructions to Bidders, Bid Forms (including the Bid, Bid Schedule(s), Information Required of Bidder, Bid Bond, and all required certificates and affidavits), Agreement, Performance Bond, Payment Bond, General Conditions, Supplementary General Conditions, Technical Specifications, Drawings,

Permits, and all addenda, and change orders executed pursuant to the provisions of the Contract Documents.

Contract Price - The total monies payable by the OWNER to the CONTRACTOR, as specified in the Agreement as a not to exceed amount, under the terms and conditions of the Contract Documents.

Contract Time - The number of successive calendar days stated in the Contract Documents for the completion of the WORK.

CONTRACTOR - The individual, partnership, corporation, joint-venture or other legal entity with whom the OWNER has executed the Agreement.

Day - A calendar day of 24 hours measured from midnight to the next midnight.

Defective Work - Work that is unsatisfactory, faulty, or deficient; or that does not conform to the Contract Documents; or that does not meet the requirements of any inspection, reference standard, test, or approval referred to in the Contract Documents; or work that has been damaged prior to the OWNER'S REPRESENTATIVE's recommendation of final payment.

Drawings - The drawings, plans, maps, profiles, diagrams, and other graphic representations which indicate the character, location, nature, extent, and scope of the WORK and are referred to in the Contract Documents. Shop Drawings are not within the meaning of this paragraph.

Effective Date of the Agreement - The date indicated in the Agreement on which it becomes effective, but if no such date is indicated it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

Engineer of Record - The individual, partnership, corporation, joint-venture or other legal entity named as such in the Contract Documents.

OWNER'S REPRESENTATIVE - The OWNER'S REPRESENTATIVE is the firm or person(s) selected by the Municipality of Skagway to perform the duties of project inspection and management.

Field Order - A written order issued by the OWNER'S REPRESENTATIVE which may or may not involve a change in the WORK.

General Requirements - Division 1 of the Technical Specifications.

Hazardous Waste - The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 9603) as amended from time to time.

Holidays - The Municipality of Skagway legal holidays occur on:

1. New Year's Day - January 1
2. Martin Luther King's Birthday - Third Monday in January
3. President's Day - Third Monday in February
4. Seward's Day - Last Monday in March
5. Memorial Day - Last Monday in May
6. Juneteenth – June 19
7. Independence Day - July 4
8. Labor Day - First Monday in September
9. Alaska Day - October 18
10. Veteran's Day - November 11
11. Thanksgiving Day - Fourth Thursday and the following Friday in November
12. Christmas Day – December 25

If any holiday listed above falls on a Saturday, Saturday and the preceding Friday are both legal holidays. If the holiday should fall on a Sunday, Sunday and the following Monday are both legal holidays.

Inspector - The authorized representative of the OWNER assigned to make detailed inspections for conformance to the Contract Documents. Any reference to the Resident Project Representative in this document shall mean the Inspector.

Laws and Regulations; Laws or Regulations - Any and all applicable laws, rules, regulations, ordinances, codes, and/or orders of any and all governmental bodies, agencies, authorities and courts having jurisdiction.

Mechanic's Lien - A form of security, an interest in real property, which is held to secure the payment of an obligation. When referred to in these Contract Documents, "Mechanic's Lien" or "lien" means "Stop Notice".

Milestone - A principal event specified in the Contract Documents relating to an intermediate completion date of a portion of the work, or a period of time within which the portion of the work should be performed prior to Substantial Completion of all the WORK.

Notice of Intent to Award - The written notice by the OWNER to the apparent successful bidder stating that upon compliance by the apparent successful bidder with the requirements listed therein, within the time specified, the OWNER will enter into an Agreement.

Notice of Award - The written notice by the OWNER to the apparent successful bidder stating that the apparent successful bidder has complied with all conditions for award of the Contract.

Notice of Completion - A form signed by the OWNER'S REPRESENTATIVE and the CONTRACTOR recommending to the OWNER that the Work is Substantially Complete and fixing the date of Substantial Completion. After acceptance of the Work by the OWNER's governing body, the form is signed by the OWNER. This filing starts the 30 day lien filing period on the Work.

Notice to Proceed - The written notice issued by the OWNER to the CONTRACTOR authorizing the CONTRACTOR to proceed with the WORK and establishing the date of commencement of the Contract Time.

OWNER - The Municipality of Skagway acting through its legally designated officials, officers, or employees.

Partial Utilization - Use by the OWNER or a substantially completed part of the WORK for the purpose for which it is intended prior to Substantial Completion of all the WORK.

PCB's - Polychlorinated biphenyls.

PERMITTEE – CONTRACTOR.

Petroleum - Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Wastes and crude oils.

Project - The total construction of which the WORK to be provided under the Contract

Documents may be the whole, or a part as indicated elsewhere in the Contract Documents.

Radioactive Material - Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.

Shop Drawings - All drawings, diagrams, illustrations, schedules and other data which are specifically prepared by or for the CONTRACTOR and submitted by the CONTRACTOR, to the OWNER'S REPRESENTATIVE, to illustrate some portion of WORK.

Specifications - (Same definition as for Technical Specifications hereinafter).

Stop Notice - A legal remedy for subcontractors and suppliers who contribute to public works, but who are not paid for their work, which secures payment from construction funds possessed by the OWNER. For public property, the Stop Notice remedy is designed to substitute for mechanic's lien rights.

Sub-Consultant - The individual, partnership, corporation, joint-venture or other legal entity having a direct contract with OWNER, or with any of its Consultants to furnish services with respect to the Project.

Subcontractor - An individual, partnership, corporation, joint-venture or other legal entity having a direct contract with the CONTRACTOR, or with any of its Subcontractors, for the performance of a part of the WORK at the site.

Substantial Completion - Refers to when the WORK has progressed to the point where, in the opinion of the OWNER'S REPRESENTATIVE as evidenced by Notice of Completion as applicable, it is sufficiently complete, in accordance with the Contract Documents, so that the WORK can be utilized for the purposes for which it is intended; or if no such notice is issued, when final payment is due in accordance with Paragraph 14.8. The terms "substantially complete" and "substantially completed" as applied to any work refer to substantial completion thereof.

Supplementary General Conditions (SGC) - The part of the Contract Documents which make additions, deletions, or revisions to these General Conditions.

Supplier - A manufacturer, fabricator, supplier, distributor, materialman, or vendor.

Technical Specifications - Divisions 1 through 16 of the Contract Documents consisting of

the General Requirements and written technical descriptions of products and execution of the WORK.

Underground Utilities - All pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities which have been installed underground to furnish any of the following services or materials: water, sewage and drainage removal, electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, traffic, or other control systems.

WORK - The entire completed construction or the various separately identifiable parts thereof required to be furnished under the Contract Documents. WORK is the result of performing, or furnishing labor and furnishing and incorporating materials and equipment into the construction, and performing or furnishing services and furnishing documents, all as required by the Contract Documents.

ARTICLE 2 PRELIMINARY MATTERS

- 2.1 **DELIVERY OF BONDS/INSURANCE CERTIFICATES.** When the CONTRACTOR delivers the signed Agreements to the OWNER, the CONTRACTOR shall also deliver to the OWNER such Bonds and Insurance Policies and Certificates as the CONTRACTOR may be required to furnish in accordance with the Contract Documents.
- 2.2 **COPIES OF DOCUMENTS.** The OWNER shall furnish to the CONTRACTOR the required number of copies of the Contract Documents specified in the Supplementary General Conditions.
- 2.3 **COMMENCEMENT OF CONTRACT TIME; NOTICE TO PROCEED.** The Contract Time will start to run on the commencement date stated in the Notice to Proceed.
- 2.4 **STARTING THE WORK**
 - A. The CONTRACTOR shall begin to perform the WORK within 7 days after the commencement date stated in the Notice to Proceed, but no work shall be done at the site prior to said commencement date.

- B. Before undertaking each part of the WORK, the CONTRACTOR shall carefully study and compare the Contract Documents and check and verify pertinent figures shown thereon and all applicable field measurements. The CONTRACTOR shall promptly report in writing to the OWNER'S REPRESENTATIVE any conflict, error, or discrepancy which the CONTRACTOR may discover and shall obtain a written interpretation or clarification from the OWNER'S REPRESENTATIVE before proceeding with any work affected thereby.
 - C. The CONTRACTOR shall submit to the OWNER'S REPRESENTATIVE for review those documents called for under Section 001300 - Contractor Submittals in the General Requirements.
- 2.5 PRE-CONSTRUCTION CONFERENCE. The Contractor is required to attend a Pre-Construction Conference. This conference will be attended by the OWNER'S REPRESENTATIVE and others as appropriate in order to discuss the WORK in accordance with the applicable procedures specified in the General Requirements, Section 001010 - Summary of Work in the General Requirements.
- 2.6 FINALIZING CONTRACTOR SUBMITTALS. At least 7 days before submittal of the first Application for Payment a conference attended by the CONTRACTOR, the OWNER'S REPRESENTATIVE and others as appropriate will be held to finalize the initial CONTRACTOR submittals in accordance with the General Requirements. As a minimum the CONTRACTOR's representatives should include the project manager and schedule expert. The CONTRACTOR should plan on this meeting taking no less than 8 hours. If the submittals are not finalized at the end of the meeting, additional meetings will be held so that the submittals can be finalized prior to the submittal of the first application for payment. No application for payment will be processed until CONTRACTOR submittals are finalized.

ARTICLE 3 CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.1 INTENT

- A. The Contract Documents comprise the entire agreement between the OWNER and the CONTRACTOR concerning the WORK. The Contract Documents shall be construed as a whole in accordance with Alaska Law.

- B. It is the intent of the Contract Documents to describe the WORK, functionally complete, to be constructed in accordance with the Contract Documents. Any work, materials, or equipment that may reasonably be inferred from the Contract Documents as being required to produce the intended result shall be supplied whether or not specifically called for. When words or phrases which have a well-known technical or construction industry or trade meaning are used to describe work, materials, or equipment such words or phrases shall be interpreted in accordance with that meaning, unless a definition has been provided in Article 1 of the General Conditions. Reference to standard specifications, manuals, or codes of any technical society, organization, or association, or to the Laws or Regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids, except as may be otherwise specifically stated. However, no provision of any referenced standard specification, manual, or code (whether or not specifically incorporated by reference in the Contract Documents) shall be effective to change the duties and responsibilities of the OWNER, the CONTRACTOR, or the OWNER'S REPRESENTATIVE or any of their consultants, agents, or employees from those set forth in the Contract Documents.
- C. If, during the performance of the WORK, CONTRACTOR discovers any conflict, error, ambiguity or discrepancy within the Contract Documents or between the Contract Documents and any provision of any such Law or Regulation applicable to the performance of the WORK or of any such standard, specification, manual or code or of any instruction of any Supplier referred to in paragraph 6.5, the CONTRACTOR shall report it to the OWNER'S REPRESENTATIVE in writing at once, and the CONTRACTOR shall not proceed with the WORK affected thereby (except in an emergency as authorized by the OWNER'S REPRESENTATIVE) until a clarification field order, or change order to the Contract Documents has been issued.

3.2 ORDER OF PRECEDENCE OF CONTRACT DOCUMENTS

- A. In resolving conflicts resulting from, errors, or discrepancies in any of the Contract Documents, the order of precedence shall be as follows:
1. Permits from other agencies as may be required by law, excepting the

- definition of "PERMITEE" in these permits.
2. Field Orders
 3. Change Orders
 4. OWNER'S REPRESENTATIVE's written interpretations and clarifications.
 5. Agreement
 6. Addenda
 7. Contractor's Bid (Bid Form)
 8. Supplementary General Conditions
 9. Notice Inviting Bids
 10. Instructions to Bidders
 11. General Conditions
 12. Technical Specifications
 13. Drawings

- B. With reference to the Drawings the order of precedence is as follows:
1. Figures govern over scaled dimensions
 2. Detail drawings govern over general drawings
 3. Addenda/change order drawings govern over Contract Drawings
- 3.3 AMENDING AND SUPPLEMENTING CONTRACT DOCUMENTS. The Contract Documents may be amended to provide for additions, deletions, and revisions in the WORK or to modify the terms and conditions thereof by a Change Order (pursuant to Article 10 CHANGES IN THE WORK).
- 3.4 REUSE OF DOCUMENTS. Neither the CONTRACTOR, nor any Subcontractor or Supplier, nor any other person or organization performing any of the WORK under a contract with the OWNER shall have or acquire any title to or ownership rights in any of the Drawings, Technical Specifications, or other documents used on the WORK, and they shall not reuse any of them on the extensions of the Project or any other project without written consent of the OWNER.

**ARTICLE 4 AVAILABILITY OF LANDS; PHYSICAL CONDITIONS;
REFERENCE POINTS**

- 4.1 AVAILABILITY OF LANDS. The OWNER shall furnish, as indicated in the Contract Documents, the lands upon which the WORK is to be performed,

rights-of-way and easements for access thereto, and such other lands which are designated for the use of the CONTRACTOR. Easements for permanent structures or permanent changes in existing facilities will be obtained and paid for by the OWNER, unless otherwise provided in the Contract Documents. Nothing contained in the Contract Documents shall be interpreted as giving the CONTRACTOR exclusive occupancy of the lands or rights-of-way provided. The CONTRACTOR shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment; provided, that the CONTRACTOR shall not enter upon nor use any property not under the control of the OWNER until a written temporary construction easement, lease or other appropriate agreement has been executed by the CONTRACTOR and the property owner, and a copy of said agreement furnished to the OWNER'S REPRESENTATIVE prior to said use; and, neither the OWNER nor the OWNER'S REPRESENTATIVE shall be liable for any claims or damages resulting from the CONTRACTOR's unauthorized trespass or use of any such properties.

4.2 PHYSICAL CONDITIONS - SUBSURFACE AND EXISTING STRUCTURES

- A. Explorations and Reports. No subsurface investigation was performed for this project.
- B. Existing Structures. Reference is made to SGC 4.2 Physical Conditions of the Supplementary General Conditions for identification of those drawings of physical conditions in or relating to existing surface and subsurface structures (except Underground Utilities referred to in Paragraph 4.4 herein) which are at or contiguous to the site that have been utilized by the OWNER'S REPRESENTATIVE in the preparation of the Contract Documents. The CONTRACTOR may rely upon the accuracy of the technical data contained in such drawings, however, nontechnical data, interpretations, and opinions contained in such drawings are not to be relied on by the CONTRACTOR. The CONTRACTOR shall be responsible for any interpretation, interpolation, or extrapolation that it makes of any information shown in such drawings.

4.3 DIFFERING SITE CONDITIONS

- A. The CONTRACTOR shall promptly upon discovery (but in no event later than 7 days thereafter) and before the following conditions are disturbed, notify the OWNER'S REPRESENTATIVE, in writing of any:
1. Material that the CONTRACTOR believes may be material that is hazardous waste, as defined in Article 1 of these General Conditions, or asbestos, PCB's, petroleum or any other substance or material posing a threat to human or to the environment.
 2. Subsurface or latent physical conditions at the site differing from those determined to exist by the CONTRACTOR in CONTRACTOR'S pre-bid site inspection and investigation.
 3. Unknown physical conditions, which were not reasonable discoverable during the CONTRACTOR'S pre-bid site inspection, and which are of unusual nature, different materially from those ordinarily encountered and generally recognized as existing in Skagway, Alaska and as inherent in WORK of the character provided for in the Contract in Skagway, Alaska.
 4. The failure of the CONTRACTOR to conduct a pre-bid site inspection constitutes a waiver of the CONTRACTOR'S opportunity for additional cost related to a differing site condition, other than as to hazardous materials in paragraph 1 above.
- B. The OWNER shall promptly investigate the conditions, and if it finds that the conditions do materially so differ, or do involve hazardous waste, and cause a decrease or increase in the CONTRACTOR's cost of, or the time required for, performance of any part of the WORK shall issue a Change Order under the procedures described in the Contract.
- C. In the event that a dispute arises between the OWNER and the CONTRACTOR whether the conditions materially differ, or involved hazardous waste or other materials listed above, or cause a decrease or increase in the CONTRACTOR's cost of, or time required for, performance of any part of the WORK, the CONTRACTOR shall not be excused from any scheduled completion date provided for by the Contract, but shall proceed with all WORK to be performed under the Contract. The CONTRACTOR shall retain those rights provided by the Agreement.

4.4 PHYSICAL CONDITIONS - UNDERGROUND UTILITIES

- A. Indicated. The information and data indicated in the Contract Documents with respect to existing Underground Utilities at or contiguous to the site are based on information and data furnished to the OWNER or the OWNER'S REPRESENTATIVE by the owners of such Underground Utilities or by others. Unless it is expressly provided in the Supplementary General Conditions and/or Section 01530 - Protection and Restoration of Existing Facilities of the General Requirements, the OWNER and the OWNER'S REPRESENTATIVE shall not be responsible for the accuracy or completeness of any such information or data, and the CONTRACTOR shall have full responsibility for reviewing and checking all such information and data, for locating all Underground Utilities indicated in the Contract Documents, for coordination of the WORK with the owners of such Underground Utilities during construction, for the safety and protection thereof and repairing any damage thereto resulting from the WORK, the cost of which will be considered as having been included in the Contract Price.

- B. Not Indicated. If an Underground Utility is uncovered or revealed at or contiguous to the site which was not indicated in the Contract Documents and which the CONTRACTOR could not reasonably have been expected to be aware of, the CONTRACTOR shall identify the owner of such Underground Utility and give written notice thereof to that owner and shall notify the OWNER'S REPRESENTATIVE in accordance with the requirements of the Supplementary General Conditions and Section 01530 - Protection and Restoration of Existing Facilities of the General Requirements.

4.5 REFERENCE POINTS

- A. The OWNER'S REPRESENTATIVE will provide one bench mark, near or on the site of the WORK, and will provide two points near or on the site to establish a base line for use by the CONTRACTOR for alignment control. Unless otherwise specified in the General Requirements, the CONTRACTOR shall furnish all other lines, grades, and bench marks required for proper execution of the WORK.

- B. The CONTRACTOR shall preserve all bench marks, stakes, and other survey marks, and in case of their removal or destruction by its own employees or by its subcontractor's employees, the CONTRACTOR shall be responsible for the accurate replacement of such reference points by personnel qualified under the Alaska Statute governing the licensing of Architects, OWNER's REPRESENTATIVES, and Land Surveyors.

ARTICLE 5 BONDS AND INSURANCE

5.1 PERFORMANCE, PAYMENT, AND OTHER BONDS

- A. The CONTRACTOR shall furnish, when required, Performance and Payment Bonds on forms provided by the Municipality of Skagway for the penal sums of 100% of the amount of the bid award. The surety on each bond may be any corporation or partnership authorized to do business in the State of Alaska as an insurer under AS 21.09. These bonds shall remain in effect for 12 months after the date of final payment and until all obligations and liens under this contract have been satisfied. The CONTRACTOR shall also furnish such other Bonds as are required by the Supplementary General Conditions. All Bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by 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 Circular 570 (amended) by the Audit Staff, Bureau of Government Financial Operations, U.S. Treasury Department. All Bonds signed by an agent must be accompanied by a certified copy of such agent's authority to act.
- B. If the surety on any Bond furnished by the CONTRACTOR is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the WORK is located, the CONTRACTOR shall within 7 days thereafter substitute another Bond and Surety, which must be acceptable to the OWNER.
- C. All Bonds required by the Contract Documents to be purchased and maintained by CONTRACTOR shall be obtained from surety companies that

are duly licensed or authorized in the State of Alaska to issue Bonds for the limits so required. Such surety companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary General Conditions. The Municipality OWNER's REPRESENTATIVE may, on behalf of the OWNER, notify the surety of any potential default or liability.

5.2 INSURANCE

- A. The CONTRACTOR shall purchase and maintain the insurance required under this paragraph. Such insurance shall include the specific coverages set out herein and be written for not less than the limits of liability and coverages provided in the Supplementary General Conditions, or required by law, whichever are greater. All insurance shall be maintained continuously during the life of the Agreement up to the date of Final Completion and at all times thereafter when the CONTRACTOR may be correcting, removing, or replacing defective work in accordance with Paragraph 13.6, but the CONTRACTOR's defense and indemnification obligations and liabilities under this Agreement shall not be deemed limited in any way to the insurance coverage required.
- B. All insurance required by the Contract Documents to be purchased and maintained by the CONTRACTOR shall be obtained from insurance companies that are duly licensed or authorized in the State of Alaska to issue insurance policies for the limits and coverages so required. Such insurance companies shall have a current Best's Rating of at least an "A" (Excellent) general policy holder's rating and a Class VII financial size category and shall also meet such additional requirements and qualifications as may be provided in the Supplementary General Conditions.
- C. The CONTRACTOR shall furnish the OWNER with certificates showing the type, amount, class of operations covered, effective dates and dates of expiration of policies. All of the policies of insurance so required to be purchased and maintained (or the certificates or other evidence thereof) shall contain a provision or endorsement that the coverage afforded will not be cancelled, reduced in coverage, or renewal refused until at least 30 days' prior written notice has been given to the OWNER by certified mail. All such insurance required herein (except for Workers' Compensation and

Employer's Liability) shall name the OWNER, its Consultants and subconsultants and their officers, directors, agents, and employees as "additional insureds" under the policies. The CONTRACTOR shall purchase and maintain the following insurance:

1. Workers' Compensation and Employer's Liability. This insurance shall protect the CONTRACTOR against all claims under applicable state workers' compensation laws. The CONTRACTOR shall also be protected against claims for injury, disease, or death of employees which, for any reason, may not fall within the provisions of a Workers' Compensation law. This policy shall include an "all states" endorsement. The CONTRACTOR shall require each subcontractor similarly to provide Workers' Compensation Insurance for all of the latter's employees to be engaged in such work unless such employees are covered by the protection afforded by the CONTRACTOR's Workers' Compensation Insurance. In case any class of employees is not protected, under the Workers' Compensation Statute, the CONTRACTOR shall provide and shall cause each subcontractor to provide adequate employer's liability insurance for the protection of such of its employees as are not otherwise protected.
2. Commercial General Liability. This insurance shall be written in comprehensive form and shall protect the CONTRACTOR against all claims arising from injuries to persons other than its employees or damage to property of the OWNER or others arising out of any act or omission of the CONTRACTOR or its agents, employees, or subcontractors and shall be in an amount not less than \$2,000,000. The policy shall contain no exclusions for any operations within the scope of this Contract.
3. Comprehensive Automobile Liability. This insurance shall be written in comprehensive form and shall protect the CONTRACTOR against all claims for injuries to members of the public and damage to property of others arising from the use of motor vehicles, and shall cover operation on or off the site of all motor vehicles licensed for highway use, whether they are owned, non-owned, or hired. Coverage for hired motor vehicles should include endorsement covering liability assumed under this Agreement.

4. Subcontractor's Commercial General Liability Insurance and Commercial Automobile Liability Insurance. The CONTRACTOR shall either require each of its subcontractors to procure and to maintain Subcontractor's Public Liability and Property Damage Insurance and Vehicle Liability Insurance of the type and in the amounts specified in the Supplementary General Conditions or insure the activities of its subcontractors. CONTRACTOR shall require each Subcontractor to have general liability insurance in an amount not less than \$2,000,000 and with the Municipality of Skagway named as an additional insured. The failure of the CONTRACTOR to require this certificate of insurance with the Municipality as an additional insured from each subcontractor shall be a material breach of this Agreement.

5. Builder's Risk. This insurance shall be of the "all risks" type, shall be written in completed value form, and shall protect the CONTRACTOR, the OWNER, and the OWNER'S REPRESENTATIVE, against risks of damage to buildings, structures, and materials and equipment. The amount of such insurance shall be not less than the insurable value of the WORK at completion. Builder's risk insurance shall provide for losses to be payable to the CONTRACTOR and the OWNER, as their interests may appear. The policy shall contain a provision that in the event of payment for any loss under the coverage provided, the insurance company shall have no rights of recovery against the CONTRACTOR, the OWNER, and the OWNER'S REPRESENTATIVE. The Builder's Risk policy shall insure against all risks of direct physical loss or damage to property from any external cause including flood and earthquake. Allowable exclusions, if any, shall be as specified in the Supplementary General Conditions.

ARTICLE 6 CONTRACTOR'S RESPONSIBILITIES

6.1 SUPERVISION AND SUPERINTENDENCE

- A. The CONTRACTOR shall supervise, inspect, and direct the WORK competently and efficiently, devoting such attention thereto and applying

such skills and expertise as may be necessary to perform the WORK in accordance with the Contract Documents. The CONTRACTOR shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction and safety precautions and programs incidental thereto. The CONTRACTOR shall be responsible to see that the completed WORK complies with the Contract Documents.

- B. The CONTRACTOR shall designate in writing and keep on the work site at all times during its progress a technically qualified, English-speaking superintendent, who is an employee of the CONTRACTOR and who shall not be replaced without written notice to the OWNER and the OWNER'S REPRESENTATIVE.
1. Superintendent shall have minimum of three similar project references in the past three years demonstrating their experience including supervisions of sub-contractors. Contractor shall submit resume and similar project references of the Superintendent for review.
 2. The superintendent will be the CONTRACTOR's representative at the site and shall have authority to act on behalf of the CONTRACTOR.
 3. All communications given to the superintendent shall be as binding as if given to the CONTRACTOR. The CONTRACTOR shall issue all its communications to the OWNER through the OWNER'S REPRESENTATIVE and the OWNER'S REPRESENTATIVE only.
 4. Contractors Superintendent is intended to be the same person from the start of the project contract to final completion. Changes of Superintendent can only be done on an emergency basis and in writing with same submittal requirements of resume and project experience.
- C. The CONTRACTOR's superintendent shall be present at the site of the WORK at all times while work is in progress. Failure to observe this requirement shall be considered suspension of the WORK by the CONTRACTOR until such time as such superintendent is again present at the site.
- D. General Coordination Procedures:
1. 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.

- a. 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.
 - b. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 - c. Make adequate provisions to accommodate items scheduled for later installation.
2. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
- a. Preparation of the Contractors construction schedule.
 - b. Preparation of the schedule of values.
 - c. Installation and removal of the temporary facilities and controls.
 - d. Delivery and processing of submittals.
 - e. Progress Meetings.
 - f. Preinstallation conferences.
 - g. Project Closeout activities.
 - h. Startup and adjustment of systems.

6.2 LABOR, MATERIALS, AND EQUIPMENT

- A. The CONTRACTOR shall provide competent, suitably qualified personnel to survey and lay out the WORK and perform construction as required by the Contract Documents. The CONTRACTOR shall furnish, erect, maintain, and remove the construction plant and any temporary works as may be required. The CONTRACTOR shall at all times maintain good discipline and order at the site. Except in connection with the safety or protection of persons or the WORK or property at the site or adjacent thereto, and except as otherwise indicated in the Contract Documents, all work at the site shall be performed

during regular working hours, and the CONTRACTOR will not permit overtime work or the performance of work on Saturday, Sunday, or any legal holiday without the OWNER's written consent. The CONTRACTOR shall apply for this consent through the OWNER'S REPRESENTATIVE.

1. Provide each temporary 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.
 2. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering the site except by entrance gates.
 - a. Extent of Fence: As required to enclose entire project site or portion determined sufficient to accommodate construction operations.
 3. 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 enclosure.
- B. All costs of inspection and testing performed during overtime work by the CONTRACTOR which is allowed solely for the convenience of the CONTRACTOR shall be borne by the CONTRACTOR. The OWNER shall have the authority to deduct the cost of all such inspection and testing from any partial payments otherwise due to the CONTRACTOR.
- C. Unless otherwise specified in the Contract Documents, the CONTRACTOR shall furnish and assume full responsibility for all materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, and all other facilities and incidentals necessary for the furnishing, performance, testing, start-up, and completion of the WORK.
 1. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
- D. All materials and equipment to be incorporated into the WORK shall be of good quality and new, except as otherwise provided in the Contract

Documents. All warranties and guarantees specifically called for by the Specifications shall expressly run to the benefit of the OWNER. If required by the OWNER'S REPRESENTATIVE, the CONTRACTOR shall furnish satisfactory evidence (including reports of required tests) as to the kind and quality of materials and equipment. All materials and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned in accordance with the instructions of the applicable Supplier except as otherwise provided in the Contract Documents; but no provisions of any such instructions will be effective to assign to the Municipality Engineer, or any of the Municipality Engineering consultants, agents, or employees, any duty or authority to supervise or direct the furnishing or performance of the WORK or any duty or authority to undertake responsibility contrary to the provisions of Paragraphs 9.9C and 9.9D.

- E. The CONTRACTOR shall at all times employ sufficient labor and equipment for prosecuting the several classes of WORK to full completion in the manner and time set forth in and required by these specifications. All workers shall have sufficient skill and experience to perform properly and in compliance with the Contract documents the WORK assigned to them. Workers engaged in special work, or skilled work, shall have sufficient experience in such work and in the operation of the equipment required to perform all WORK, properly and satisfactorily.
- F. Any person employed by the CONTRACTOR or by any SUBCONTRACTOR who, in the opinion of the OWNER'S REPRESENTATIVE, does not perform the WORK in a proper and skillful manner, or is intemperate or disorderly shall, at the written request of the OWNER'S REPRESENTATIVE, be removed immediately by the CONTRACTOR or SUBCONTRACTOR employing that person, and shall not be employed again in any portion of the WORK without the written approval of the OWNER'S REPRESENTATIVE. Should the CONTRACTOR fail to remove that person or persons as required above, or fail to furnish suitable and sufficient personnel for the proper prosecution of the WORK, the OWNER'S REPRESENTATIVE may suspend the WORK by written notice until such orders are complied with by the Contractor.
- G. Moisture And Mold Control
 - 1. Contractor's Moisture-Protection Plan: Avoid trapping water in

- finished work. Document visible signs of mold that may appear during construction.
2. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
 - a. Protect porous materials from water damage.
 - b. Protect stored and installed material from flowing or standing water.
 - c. Keep porous and organic materials from coming into prolonged contact with concrete.
 - d. Remove standing water from decks.
 - e. Keep deck openings covered or dammed.
 3. Partially Enclosed Construction Phase: 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:
 - a. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
 - b. Keep interior spaces reasonably clean and protected from water damage.
 - c. Periodically collect and remove waste containing cellulose or other organic matter.
 - d. Discard or replace water-damaged material.
 - e. Do not install material that is wet.
 - f. Discard, replace, or clean stored or installed material that begins to grow mold.
 - g. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.
 4. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
 - a. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 - b. Use permanent HVAC system to control humidity if able.
 - c. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

- i. 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.
 - ii. 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.
 - iii. Remove materials that cannot be completely restored to their manufactured moisture level within 48 hours.
- 6.3 ADJUSTING PROGRESS SCHEDULE. The CONTRACTOR shall submit monthly updates of the progress schedule to the OWNER'S REPRESENTATIVE for acceptance in accordance with the provisions in Section 01300 - Contractor Submittals in the General Requirements.
- 6.4 SUBSTITUTES OR "OR-EQUAL" ITEMS. The CONTRACTOR shall submit proposed substitutes or "or-equal" items in accordance with the provisions in Section 001300 - Contractor Submittals in the General Requirements.
- 6.5 CONCERNING SUBCONTRACTORS, SUPPLIERS, AND OTHERS. The CONTRACTOR shall be responsible to the OWNER and the OWNER'S REPRESENTATIVE for the acts and omissions of its subcontractors and their employees to the same extent as CONTRACTOR is responsible for the acts and omissions of its own employees. Nothing contained in this Paragraph shall create any contractual relationship between any subcontractor and the OWNER or the OWNER'S REPRESENTATIVE nor relieve the CONTRACTOR of any liability or obligation under the prime Contract.
- 6.6 PERMITS
 - A. Unless otherwise provided in the Supplementary General Conditions, the CONTRACTOR shall obtain and pay for all construction permits and licenses from the agencies having jurisdiction, including the furnishing of insurance and bonds if required by such agencies. The enforcement of such requirements under this Contract shall not be made the basis for claims for

additional compensation. The OWNER shall assist the CONTRACTOR, when necessary, in obtaining such permits and licenses. The CONTRACTOR shall pay all governmental charges and inspection fees necessary for the prosecution of the WORK, which are applicable at the time of opening of Bids. The CONTRACTOR shall pay all charges of utility owners for connections to the WORK.

- B. These Contract Documents may require that the WORK be performed within the conditions and/or requirements of local, state and/or federal permits. These permits may be bound within the Contract Documents, included within the Contract Documents by reference, or included as part of the WORK, as designated in this Section. The CONTRACTOR is responsible for completing the WORK required for compliance with all permit requirements; this WORK is incidental to other items in the Contract Documents. Any reference to the "permittee" in the permits shall mean the CONTRACTOR. If any permits were acquired by the OWNER, this action was done to expedite the start of construction. If the CONTRACTOR does not complete the WORK within the specified permit window, the CONTRACTOR shall be responsible for the permit extension, and for completing any additional requirements placed upon the permit.
- 6.7 PATENT FEES AND ROYALTIES. The 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, software or device which 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 the OWNER or the OWNER'S REPRESENTATIVE 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. The CONTRACTOR shall indemnify, defend and hold harmless the OWNER and the OWNER'S REPRESENTATIVE and anyone directly or indirectly employed by either of them from and against all claims, damages, losses, and expenses (including attorneys' fees and court costs) arising out of 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, and shall defend all such claims in connection with any alleged infringement of such rights.

- 6.8 **LAWS AND REGULATIONS.** The CONTRACTOR shall observe and comply with all federal, state, and local laws, ordinances, codes, orders, and regulations which in any manner affect those engaged or employed on the WORK, the materials used in the WORK, or the conduct of the WORK. If any discrepancy or inconsistency should be discovered in this Contract in relation to any such law, ordinance, code, order, or regulation, the CONTRACTOR shall report the same in writing to the OWNER'S REPRESENTATIVE. The CONTRACTOR shall indemnify, defend, and hold harmless the OWNER, the OWNER'S REPRESENTATIVE, and their officers, agents, and employees against all claims or liability arising from violation of any federal, state, or local law, ordinance, code, order, or regulation, whether by CONTRACTOR or by its employees, subcontractors, or third parties. Any particular law or regulation specified or referred to elsewhere in the Contract Documents shall not in any way limit the obligation of the CONTRACTOR to comply with all other provisions of federal, state, and local laws and regulations. The OWNER may, per AS 36.30, audit the CONTRACTOR's or subcontractor(s) records that are related to the cost or pricing data for this contract, all related change orders, and/or contract modifications.
- 6.9 **TAXES.** The CONTRACTOR shall pay all sales, consumer, use, and other similar taxes required to be paid by the CONTRACTOR in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the WORK.
- 6.10 **USE OF PREMISES.** The CONTRACTOR shall confine construction equipment, the storage of materials and equipment, and the operations of workers to (1) the Project site, (2) the land and areas identified in and permitted by the Contract Documents, and (3) the other land and areas permitted by Laws and Regulations, rights-of-way, permits, leases and easements. The CONTRACTOR shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof or of any land or areas contiguous thereto, resulting from the performance of the WORK. Should any claim be made against the OWNER or the OWNER'S REPRESENTATIVE by any such owner or occupant because of the performance of the WORK, the CONTRACTOR shall promptly attempt to settle with such other party by agreement or otherwise resolve the claim through litigation. The CONTRACTOR shall, indemnify, defend, and hold the OWNER and the OWNER'S REPRESENTATIVE harmless from and against all claims, damages, losses, and expenses (including, but not limited to, fees of OWNER's

Representatives attorneys, and other professionals and court costs) arising directly, indirectly, or consequentially out of any action, legal or equitable, brought by any such owner or occupant against the OWNER, the OWNER'S REPRESENTATIVE, their Consultants, Sub-consultants, and the officers, directors, employees and agents of each and any of them to the extent caused by or based upon the CONTRACTOR's performance of the WORK.

6.11 SAFETY AND PROTECTION

- A. The CONTRACTOR shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the WORK. The CONTRACTOR shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:
1. All employees on the WORK and other persons and organizations who may be affected thereby;
 2. all the WORK and materials and equipment to be incorporated therein, whether in storage on or off the site; and
 3. other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.
- B. The CONTRACTOR shall comply with all federal, state and local laws and regulations whether referred to herein or not) of any public agency or governing body having jurisdiction for the safety of persons or property or to protect them from damage, injury, or loss and shall erect and maintain all necessary safeguards for such safety and protection. The CONTRACTOR shall notify owners of adjacent property and utilities when prosecution of the WORK may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.
- C. The CONTRACTOR shall designate a qualified and experienced safety representative at the site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and program.

- D. Materials that contain hazardous substances or mixtures may be required on the WORK. A Material Safety Data Sheet shall be requested by the CONTRACTOR from the manufacturer of any hazardous product used.
- E. Material usage shall be accomplished with strict adherence to all safety requirements and all manufacturer's warnings and application instructions listed on the Material Safety Data Sheet and on the product container label.
- F. The CONTRACTOR shall be responsible for coordinating communications on any exchange of Material Safety Data Sheets or other hazardous material information that is required to be made available to, or exchanged between, or among, employers at the site in accordance with Laws or Regulations.
- G. The CONTRACTOR shall notify the OWNER'S REPRESENTATIVE if it considers a specified product or its intended usage to be unsafe. This notification must be given to the OWNER'S REPRESENTATIVE prior to the product being ordered, or if provided by some other party, prior to the product being incorporated in the work.

6.12 SHOP DRAWINGS AND SAMPLES

- A. After checking and verifying all field measurements and after complying with applicable procedures specified in the General Requirements, the CONTRACTOR shall submit to the OWNER'S REPRESENTATIVE for review, all shop drawings in accordance with Section 01300 -Contractor Submittals in the General Requirements.
- B. The CONTRACTOR shall also submit to the OWNER'S REPRESENTATIVE for review all samples in accordance with Section 001300 - Contractor Submittals in the General Requirements.
- C. Before submittal of each shop drawing or sample, the CONTRACTOR shall have determined and verified all quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers, and similar data with respect thereto and reviewed or coordinated each shop drawing or sample with other shop drawings and samples and with the requirements of the WORK and the Contract Documents.

6.13 CONTINUING THE WORK. The CONTRACTOR shall carry on the WORK and

adhere to the progress schedule during all disputes or disagreements with the OWNER. No work shall be delayed or postponed pending resolution of any disputes or disagreements, except as the CONTRACTOR and the OWNER may otherwise agree in writing.

6.14 INDEMNIFICATION

- A. The CONTRACTOR shall indemnify, defend, and hold harmless the OWNER, the OWNER'S REPRESENTATIVE, their Consultants, Sub-consultants and the officers, directors, employees, representatives and agents of each and any of them, against and from all claims and liability, including death, arising out of or related to this agreement or, by reason of or incidentally to the Contract or any performance of the WORK, The CONTRACTOR'S obligation to defend and indemnify the Municipality of Skagway shall include but not be limited to the following:
1. Liability or claims resulting directly or indirectly from the negligence or carelessness or omissions of the CONTRACTOR, its employees, or agents or subcontractors in the performance of the WORK, or in guarding or maintaining the same, or from any improper materials, implements, or appliances used in its construction, or by or on account of any act or omission of the CONTRACTOR, its employees, agents, or third parties;
 2. Liability or claims arising directly or indirectly from bodily injury, occupational sickness or disease, or death of the CONTRACTOR's or Subcontractor's own employees engaged in the WORK resulting in actions brought by or on behalf of such employees against the OWNER, and the OWNER'S REPRESENTATIVE;
 3. Liability or claims arising directly or indirectly from or based on the violation of any law, ordinance, regulation, order, or decree, whether by the CONTRACTOR, its employees, or agents;
 4. Liability or claims arising directly or indirectly from the use or manufacture by the CONTRACTOR, its employees, or agents in the performance of this Contract of any copyrighted or non-copyrighted composition, secret process, patented or non-patented invention, computer software, article, or appliance, unless otherwise specifically stipulated in this Contract.
 5. Liability or claims arising directly or indirectly from the breach of

- any warranties, whether express or implied, made to the OWNER or any other parties by the CONTRACTOR, its employees, or agents;
 6. Liabilities or claims arising directly or indirectly from the willful or criminal misconduct of the CONTRACTOR, its employees, or agents or subcontractors; and,
 7. Liabilities or claims arising directly or indirectly from any breach of the obligations assumed herein by the CONTRACTOR.
 8. Liability or claims, including by any federal or state agency, and including any administrative proceeding, involving, or related to the use or discharge of any hazardous material by CONTRACTOR, or list subcontractors, employees, consultants, representatives, agents, or invitees.
 9. Any other claim of any kind and any nature arising out of any performance of the WORK by the CONTRACTOR, its agents, or subcontractors.
- B. The CONTRACTOR shall reimburse the OWNER'S REPRESENTATIVE and the OWNER for all costs and expenses, (including but not limited to fees and charges of OWNER's Representatives, attorneys, and other professionals and court costs including all costs of appeals) incurred by said OWNER, and the OWNER'S REPRESENTATIVE in enforcing the provisions of this Paragraph 6.14.
- C. The defense and indemnification obligation under this Paragraph 6.14 shall not be limited in any way by any limitation of the amount or type of damages, compensation, or benefits payable by or for the CONTRACTOR or any such subcontractor or other person or organization under workers' compensation acts, disability benefit acts, or other employee benefit acts.
- 6.15 CONTRACTOR'S DAILY REPORTS. The CONTRACTOR shall complete a daily report indicating total manpower for each construction trade, major equipment on site, each subcontractor's manpower, weather conditions, etc., involved in the performance of the WORK. The daily report shall be completed on forms provided by the OWNER'S REPRESENTATIVE and shall be submitted to the OWNER'S REPRESENTATIVE at the conclusion of each work day. The report should comment on the daily progress and status of the work within each major component of the work. These components will be decided by the OWNER'S REPRESENTATIVE.

- 6.16 **ASSIGNMENT OF CONTRACT.** The CONTRACTOR shall not assign, sublet, sell, transfer, or otherwise dispose of the Contract or any portion thereof, or its right, title, or interest therein, or obligations thereunder, without the written consent of the OWNER except as imposed by law. If the CONTRACTOR violates this provision, the Contract may be terminated at the option of the OWNER. In such event, the OWNER shall be relieved of all liability and obligations to the CONTRACTOR and to its assignee or transferee, growing out of such termination. CONTRACTOR acknowledges and understands that the Municipality may refuse to allow an assignment to an LLC without a guarantee from the members of the LLC, in the Municipality's sole discretion.
- 6.17 **CONTRACTOR'S RESPONSIBILITY FOR UTILITY PROPERTY AND SERVICES.** It is understood that any turn-on or turn-off, line locates and any other work or assistance necessary by the MUNICIPALITY OF SKAGWAY Utilities Divisions, will be at the CONTRACTOR's expense unless otherwise stated in the bid documents. All cost must be agreed to prior to any related actions, and will be considered incidental to the project cost. Billing to the CONTRACTOR will be direct from the MUNICIPALITY OF SKAGWAY Utilities Divisions.
- 6.18 **OPERATING WATER SYSTEM VALVES**
- A. The CONTRACTOR shall submit a written request, to the OWNER'S REPRESENTATIVE, for approval to operate any valve on any in-service section of the Municipality of Skagway water system. The request must be submitted at least 24-hours prior to operating any valves. The Municipality of Skagway Public Works Department reserves the right to approve or deny the request. The request shall specifically identify each valve to be operated, the time of operation, and the operation to be performed. The CONTRACTOR shall obtain the written approval of the OWNER'S REPRESENTATIVE for any scheduled operation before operating any valve.
- B. The CONTRACTOR shall be responsible for all damages, both direct and consequential, property and personal injury, including death, to the Municipality or any other party, caused by unauthorized operation of any valve of the Municipality of Skagway water system.

6.19 **CONTRACTOR'S WORK SCHEDULE LIMITATIONS.** It is unlawful to operate any pile driver, power shovel, pneumatic hammer, derrick, power hoist, or similar heavy construction equipment before 7:00 a.m. or after 10:00 p.m., Monday through Friday, or before 9:00 a.m. or after 10:00 p.m., Saturday and Sunday, unless a permit shall first be obtained from the Municipality of Skagway Municipality Administrator. Such permit shall be issued by the Municipality Administrator only upon a determination that such operation during hours not otherwise permitted hereunder is necessary and will not result in unreasonable disturbance to surrounding residents.

6.20 **PROGRESS MEETINGS**

- A. Weekly progress meetings will be held via teleconference, unless otherwise arranged.
- B. Attendees will include the Owner, Engineer, Contractor, subcontractors, and suppliers' representatives as may be needed, other Contractors working at the site, and other interested or affected parties.
- C. The specific purpose of the weekly meetings is to coordinate the efforts of all concerned so that the project progresses without delay to completion, with the least inconvenience.
- D. Bring a three week look ahead schedule to each weekly meeting, including the following items:
 - 1. Work completed last week.
 - 2. Work anticipated for the next two weeks ("Look Ahead").
 - 3. Subcontractors on site the prior week.
 - 4. Subcontractors scheduled on site for the next two weeks.
 - 5. Contract document deficiencies or questions noted during prior week.
 - 6. Anything that could impede the progress of the work or affect the critical path on the project schedule.
 - 7. Corrective measures and procedures planned to regain planned schedule, cost or quality assurance, if necessary.
 - 8. Report of any accidents, and any site safety issues that need to be addressed.
- E. Other Agenda items to be discussed:
 - 1. Review and revise as necessary and approve minutes of previous

- meetings.
- 2. Status of submittals of equipment and shop drawings.
- 3. Identify problems that impede planned progress.
- 4. Other current business.

F. Revision of Minutes:

- 1. Unless published minutes are challenged in writing prior to the next regularly scheduled progress meeting, they will be accepted as properly stating the activities and decisions of the meeting.
- 2. Persons challenging published minutes shall reproduce and distribute copies of the challenge to all indicated recipients of the particular set of minutes.
- 3. Challenge to minutes shall be settled as priority item of "old business" at the next regularly scheduled meeting.

G. Minutes of Meeting:

- 1. The Engineer or their Representative will compile minutes of each project meeting and will furnish electronic copies to the Contractor.

6.21 OTHER MEETINGS

A. Other meetings will be required to facilitate progress of the Work. These include, but are not limited to the following:

- 1. Pre-Installation Conferences:
 - a. Coordinate and schedule with Engineer for each material, product or system specified.
 - i. Conferences to be held prior to initiating installation, but not more than two (2) weeks before scheduled initiation of installation.
 - ii. Conferences may be combined if installation schedule of multiple components occurs within the same two (2) week interval.
 - iii. Review manufacturers recommendations and Contract Documents Specification Sections.
- 2. Facility Startup Planning and Coordination Meeting.

ARTICLE 7 OTHER WORK

7.1 RELATED WORK AT SITE

- A. The OWNER may perform other work related to the Project at the site by the OWNER's own forces, have other work performed by utility owners, or let other direct contracts therefor which may contain General Conditions similar to these. If the fact that such other work is to be performed was not noted in the Contract Documents, written notice thereof will be given to the CONTRACTOR prior to starting any such other work.
- B. The CONTRACTOR shall afford each other contractor who is a party to such a direct contract and each utility owner (or the OWNER, if the OWNER is performing the additional work with the OWNER's employees) proper and safe access to the site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such work, and shall properly connect and coordinate the WORK with theirs. The CONTRACTOR shall do all cutting, fitting, and patching of the WORK that may be required to make its several parts come together properly and integrate with such other work. The CONTRACTOR shall not endanger any work of others by cutting, excavating, or otherwise altering their work and will only cut or alter their work with the written consent of the OWNER'S REPRESENTATIVE and the others whose work will be affected.
- C. If the proper execution or results of any part of the CONTRACTOR's work depends upon the work of any such other contractor or utility owner (or OWNER), the CONTRACTOR shall inspect and report to the OWNER'S REPRESENTATIVE in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for such proper execution and results. The CONTRACTOR's failure to report such delays, defects, or deficiencies will constitute an acceptance of the other work as fit and proper for integration with the CONTRACTOR's work except for latent or nonapparent defects and deficiencies in the other work.

7.2 **COORDINATION.** If the OWNER contracts with others for the performance of other work on the Project at the site, the person or organization who will have authority and responsibility for coordination of the activities among the various prime contractors will be identified in the Supplementary General Conditions, and

the specific matters to be covered by such authority and responsibility will be itemized and the extent of such authority and responsibilities will be provided in the Supplementary General Conditions.

ARTICLE 8 OWNER'S RESPONSIBILITIES

8.1 COMMUNICATIONS

A. The OWNER shall issue all its communications to the CONTRACTOR through the OWNER'S REPRESENTATIVE.

B. The CONTRACTOR shall issue all its communications to the OWNER through the OWNER'S REPRESENTATIVE.

8.2 PAYMENTS. The OWNER shall make payments to the CONTRACTOR as provided in Paragraphs 14.5, 14.8, 14.9 and 14.10.

8.3 LANDS, EASEMENTS, AND SURVEYS. The OWNER's duties in respect of providing lands and easements and providing surveys to establish reference points are set forth in Paragraphs 4.1 and 4.5.

8.4 CHANGE ORDERS. The OWNER shall execute Change Orders as indicated in Paragraph 10.1F.

8.5 INSPECTIONS AND TESTS. The OWNER's responsibility in respect of inspections, tests, and approvals is set forth in Paragraph 13.3.

8.6 SUSPENSION OF WORK. In connection with the OWNER's right to stop work or suspend work, see Paragraphs 13.4 and 15.1.

8.7 TERMINATION OF AGREEMENT. Paragraphs 15.2 and 15.3 deal with the OWNER's right to terminate services of the CONTRACTOR.

ARTICLE 9 OWNER'S REPRESENTATIVE'S STATUS DURING CONSTRUCTION

9.1 OWNER'S REPRESENTATIVE. The OWNER'S REPRESENTATIVE will be the

- OWNER's representative during the construction period. The duties and responsibilities and the limitations of authority of the OWNER'S REPRESENTATIVE as the OWNER's representative during construction are set forth in the Contract Documents.
- 9.2 VISITS TO SITE. The OWNER'S REPRESENTATIVE will make visits to the site during construction to observe the progress and quality of the WORK and to determine, in general, if the WORK is proceeding in accordance with the Contract Documents. Exhaustive or continuous on-site inspections to check the quality or quantity of the WORK will not be required of the OWNER'S REPRESENTATIVE. The OWNER'S REPRESENTATIVE will not, during such visits, or as a result of such observations of the CONTRACTOR's work in progress, supervise, direct, or have control over the CONTRACTOR's work and decisions related to the performance of the WORK.
- 9.3 PROJECT REPRESENTATION. The OWNER'S REPRESENTATIVE may furnish an Inspector to assist in observing the performance of the WORK. The duties, responsibilities, and limitations of authority are as follows:

A. Duties, Responsibilities and Limitations of Authority of Inspector

General. The Inspector, who is the OWNER'S REPRESENTATIVE's Agent, will act as directed by and under the supervision of the OWNER'S REPRESENTATIVE and will confer with the OWNER'S REPRESENTATIVE regarding its actions. The Inspector's dealings in matters pertaining to the on-site WORK shall, in general, be only with the OWNER'S REPRESENTATIVE and the CONTRACTOR, and dealings with subcontractors shall only be through or with the full knowledge of the CONTRACTOR. Written communication with the OWNER will be only through or as directed by the OWNER'S REPRESENTATIVE.

Duties and Responsibilities. The Inspector will:

1. Review the progress schedule, list of Shop Drawing submittals and schedule of values prepared by the CONTRACTOR and consult with the OWNER'S REPRESENTATIVE concerning their acceptability.
2. Attend pre-construction conferences. Arrange a schedule of progress meetings and other job conferences as required in consultation with

- the OWNER'S REPRESENTATIVE and notify those expected to attend in advance. Attend meetings and maintain and circulate copies of minutes thereof.
3. Serve as the OWNER'S REPRESENTATIVE's liaison with the CONTRACTOR, working principally through the CONTRACTOR's superintendent and assist said superintendent in understanding the intent of the Contract Documents. Assist the OWNER'S REPRESENTATIVE in serving as the OWNER's liaison with the CONTRACTOR when the CONTRACTOR's operations affect the OWNER's on-site operations.
 4. As requested by the OWNER'S REPRESENTATIVE, assist in obtaining from the OWNER additional details or information, when required at the site for proper execution of the WORK.
 5. Receive and record date of receipt of Shop Drawings and samples, receive samples which are furnished at the site by the CONTRACTOR and notify the OWNER'S REPRESENTATIVE of their availability for examination.
 6. Conduct on-site observations of the WORK in progress to assist the OWNER'S REPRESENTATIVE in determining if the WORK is proceeding in accordance with the Contract Documents.
 7. Report to the OWNER'S REPRESENTATIVE whenever the Inspector believes that any work is unsatisfactory, faulty, or defective or does not conform to the Contract Documents, or does not meet the requirements of any inspection, tests or approval required to be made or has been damaged prior to final payment; and advise the OWNER'S REPRESENTATIVE when the Inspector believes work should be corrected or rejected or should be uncovered for observation, or requires special testing, inspection, or approval.
 8. Verify that the tests, equipment, and systems startups and operating and maintenance instruction are conducted as required by the Contract Documents and in presence of the required personnel, and that the CONTRACTOR maintains adequate records thereof; observe, record and report to the OWNER'S REPRESENTATIVE appropriate details relative to the test procedures and start-ups.
 9. Accompany visiting inspectors representing public or other agencies having jurisdiction over the WORK, record the outcome of these inspections, and report to the OWNER'S REPRESENTATIVE.
 10. Transmit to the CONTRACTOR the OWNER'S

- REPRESENTATIVE's clarifications and interpretations of the Contract Documents.
11. Consider and evaluate the CONTRACTOR's suggestions for modifications in the Contract Documents and report them with recommendations to the OWNER'S REPRESENTATIVE.
 12. Maintain at the job site orderly files for correspondence, reports of job conferences, Shop Drawings and sample submittals, reproductions of original Contract Documents including all addenda, change orders, field orders, additional Drawings issued subsequent to the execution of the Contract, the OWNER'S REPRESENTATIVE's clarifications and interpretations of the Contract Documents, progress reports, and other related documents.
 13. Keep a diary or log book, recording hours on the job site, weather conditions, data relative to questions of extras or deductions, list all project visitors, daily activities, decisions, observations in general, and specific observations in more detail as in the case of performing and observing test procedures. Send copies to the OWNER'S REPRESENTATIVE.
 14. Record names, addresses, and telephone numbers of the CONTRACTOR, subcontractors, and major suppliers of materials and equipment.
 15. Furnish the OWNER'S REPRESENTATIVE with periodic reports as required of progress of the WORK and the CONTRACTOR's compliance with the accepted progress schedule and schedule of CONTRACTOR submittals.
 16. Consult with the OWNER'S REPRESENTATIVE in advance of scheduled major tests, inspections, or start of important phases of the WORK.
 17. Report immediately to the OWNER'S REPRESENTATIVE upon the occurrence of any accident.
 18. Review applications for payment with the CONTRACTOR for compliance with the established procedure for their submittal and forward them with recommendations to the OWNER'S REPRESENTATIVE, noting particularly their relation to the schedule of values, work completed, and materials and equipment delivered at the site but not incorporated in the WORK.
 19. During the course of the WORK, verify that certificates, maintenance and operation manuals, and other data required to be assembled and

- furnished by the CONTRACTOR are applicable to the items actually installed; and deliver this material to the OWNER'S REPRESENTATIVE for its review and forwarding to the OWNER prior to final acceptance of the WORK.
20. Before the OWNER'S REPRESENTATIVE prepares a Certificate of Substantial Completion/Notice of completion, as applicable, review the CONTRACTOR's punch list items requiring completion or correction and add any items that CONTRACTOR has omitted.
 21. Conduct final inspection in the company of the OWNER'S REPRESENTATIVE, the OWNER, and the CONTRACTOR, and prepare a final punch list of items to be completed or corrected.
 22. Verify that all items on the punch list have been completed or corrected and make recommendations to the OWNER'S REPRESENTATIVE concerning acceptance.

Limitations of Authority. Except upon written instruction of the OWNER'S REPRESENTATIVE, the Inspector:

1. Shall not authorize any deviation from the Contract Documents or approve any substitute material or equipment.
2. Shall not exceed limitations on the OWNER'S REPRESENTATIVE's authority as set forth in the Contract Documents.
3. Shall not undertake any of the responsibilities of the CONTRACTOR, subcontractors or CONTRACTOR's superintendent, or expedite the WORK.
4. Shall not advise on or issue directions relative to any aspect of the means, methods, techniques, sequences, or procedures of construction unless such is specifically called for in the Contract Documents.
5. Shall not advise on or issue directions as to safety precautions and programs in connection with the WORK.

9.4 CLARIFICATIONS AND INTERPRETATIONS. The OWNER'S REPRESENTATIVE will issue within 7 business days such written clarifications or interpretations of the requirements of the Contract Documents (in the form of Drawings or otherwise) as the OWNER'S REPRESENTATIVE may determine necessary, which shall be consistent with, or reasonably inferred from, the overall

- intent of the Contract Documents.
- 9.5 **AUTHORIZED VARIATIONS IN WORK.** The OWNER'S REPRESENTATIVE may authorize variations in the WORK from the requirements of the Contract Documents. These may be accomplished by a Field Order and will require the CONTRACTOR to perform the work involved in a manner that minimizes the impact to the Work and the Contract Completion date. If the CONTRACTOR believes that a Field Order justifies an increase in the Contract Price or an extension of the Contract Time, the CONTRACTOR may make a claim therefor as provided in Article 11 or 12.
- 9.6 **REJECTING DEFECTIVE WORK.** The OWNER'S REPRESENTATIVE will have authority to reject work which the OWNER'S REPRESENTATIVE believes to be defective and will also have authority to require special inspection or testing of the WORK as provided in Paragraph 13.3G, whether or not the WORK is fabricated, installed, or completed.
- 9.7 **CONTRACTOR SUBMITTALS, CHANGE ORDERS, AND PAYMENTS**
- A. In accordance with the procedures set forth in the General Requirements, the OWNER'S REPRESENTATIVE will review all CONTRACTOR submittals, including shop drawings, samples, substitutes, or "or equal" items, etc., in order to determine if the items covered by the submittals will, after installation or incorporation in the WORK, conform to the requirements of the Contract Documents and be compatible with the design concept of the completed project as a functioning whole as indicated by the Contract Documents. The OWNER'S REPRESENTATIVE's review will not extend to means, methods, techniques, sequences or procedures of construction or to safety precautions or programs incident thereto.
- B. In connection with the OWNER'S REPRESENTATIVE's responsibilities as to Change Orders, see Articles 10, 11, and 12.
- C. In connection with the OWNER'S REPRESENTATIVE's responsibilities in respect of Applications for Payment, see Article 14.

9.8 DECISIONS ON DISPUTES

- A. The OWNER'S REPRESENTATIVE will be the initial interpreter of the requirements of the Contract Documents and will decide the acceptability of the WORK. Claims and disputes relating to the acceptability of the WORK; the interpretation of the requirements of the Contract Documents pertaining to the performance of the WORK; and those claims under Articles 11 and 12 in respect to changes in the Contract Price or Contract Time will be referred initially to the OWNER'S REPRESENTATIVE in writing with a request for formal decision in accordance with this paragraph, which the OWNER'S REPRESENTATIVE will render in writing within 30 days of receipt of the request. Written notice of each such claim or dispute will be delivered by the CONTRACTOR to the OWNER'S REPRESENTATIVE promptly (but in no event later than 30 days) after the submission of the claim or dispute in writing. Written supporting data will be submitted to the OWNER'S REPRESENTATIVE within 60 days after such occurrence unless the OWNER'S REPRESENTATIVE allows an additional period of time to ascertain more accurate data in support of the claim. The failure of the CONTRACTOR to submit a claim or dispute in writing to the OWNER'S REPRESENTATIVE within 30 days of the occurrence of the event upon which the claim or dispute is based shall constitute a waiver by the CONTRACTOR for any additional monies and as to any request for additional time.
- B. The rendering of a decision by the OWNER'S REPRESENTATIVE with respect to any such claim or dispute (except any which have been waived by the making or acceptance of final payment as provided in Paragraph 14.12) will be a condition precedent to any exercise by the OWNER or the CONTRACTOR) of such rights or remedies as either may otherwise have or attempt to exercise under the Contract Documents or by Section IX (k) of the Agreement,.

9.9 LIMITATION ON OWNER'S REPRESENTATIVE'S RESPONSIBILITIES

- A. Neither the OWNER'S REPRESENTATIVE's authority to act under this Article or other provisions of the Contract Documents nor any decision made by the OWNER'S REPRESENTATIVE in good faith either to exercise or not exercise such authority shall give rise to any duty or responsibility of the

OWNER'S REPRESENTATIVE to the CONTRACTOR, any Subcontractor, any Supplier, any surety for any of them, or any other person or organization performing any of the WORK.

- B. Whenever in the Contract Documents the terms "as ordered," "as directed," "as required," "as allowed," "as reviewed," "as approved," or terms of like effect or import are used, or the adjectives "reasonable," "suitable," "acceptable," "proper," or "satisfactory" or adjectives of like effect or import are used to describe a requirement, direction, review, or judgment of the OWNER'S REPRESENTATIVE as to the WORK, it is intended that such requirement, direction, review, or judgment will be solely to evaluate the WORK for compliance with the requirements of the Contract Documents, and conformance with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents, unless there is a specific statement indicating otherwise. The use of any such term or adjective shall not be effective to assign to the OWNER'S REPRESENTATIVE any duty or authority to supervise or direct the performance of the WORK or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.9C or 9.9D.
- C. The OWNER'S REPRESENTATIVE will not supervise, direct, control, or have authority over or be responsible for the CONTRACTOR's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs in performing the WORK, or for any failure of the CONTRACTOR to comply with Laws and Regulations, applicable to the performance of the WORK. The OWNER'S REPRESENTATIVE will not be responsible to the CONTRACTOR or its subcontractors for the CONTRACTOR's failure to perform the WORK in accordance with the Contract Documents.
- D. The OWNER'S REPRESENTATIVE will not be responsible for the acts or omissions of the CONTRACTOR nor of any subcontractor, supplier, or any other person or organization performing any of the WORK.

ARTICLE 10 CHANGES IN THE WORK

10.1 GENERAL

- A. Without invalidating the Agreement and without notice to any surety, the OWNER may at any time or from time to time, order additions, deletions, or revisions in the WORK; these will be authorized by a written Field Order and/or a Change Order issued by the OWNER'S REPRESENTATIVE.
- B. If the CONTRACTOR believes that it is entitled to an increase or decrease in the Contract Price, or an extension or shortening in the Contract Time as the result of a Field Order, a claim may be made as provided in Articles 11 and 12.
- C. If the OWNER and CONTRACTOR agree on the value of any work, or the amount of Contract Time that should be allowed as a result of a Field Order, upon receiving written notice from the OWNER'S REPRESENTATIVE, the CONTRACTOR shall proceed so as to minimize the impact on and delays to the work pending the issuance of a Change Order.
- D. If the OWNER and the CONTRACTOR are unable to agree as to the extent, if any, of an increase or decrease in the Contract Price or an extension or shortening of the Contract Time that should be allowed as a result of a Field Order, the OWNER'S REPRESENTATIVE can direct the CONTRACTOR to proceed on the basis of Time and Materials so as to minimize the impact on and delays to the work, and a claim may be made therefor as provided in Articles 11 and 12.
- E. The CONTRACTOR shall not be entitled to an increase in the Contract Price nor an extension of the Contract Time with respect to any work performed that is not required by the Contract Documents as amended, modified, supplemented by Change Order, except in the case of an emergency and except in the case of uncovering work as provided in Paragraph 13.3G.
- F. The OWNER and the CONTRACTOR shall execute appropriate Change Orders covering:
 - 1. changes in the WORK which are ordered by the OWNER pursuant to

- Paragraph 10.1A;
2. changes required because of acceptance of defective work under Paragraph 13.7;
 3. changes in the Contract Price or Contract Time which are agreed to by the parties; or
 4. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by the OWNER'S REPRESENTATIVE pursuant to Paragraph 9.8.
- G. If notice of any change is required by the provisions of any Bond to be given to a surety, the giving of any such notice will be the CONTRACTOR's responsibility, and the amount of each applicable Bond shall be adjusted accordingly.

10.2 ALLOWABLE QUANTITY VARIATIONS

- A. In the event of an increase or decrease in bid item quantity of a unit price contract, the total amount of work actually done or materials or equipment furnished shall be paid for according to the unit price established for such work under the Contract Documents, wherever such unit price has been established; provided, that an adjustment in the Contract Price may be made for changes which result in an increase or decrease in excess of 25% of the estimated quantity of any major item of the WORK. Major Item is defined as any bid item amount that is ten percent (10%) or more of the total contract amount.
- B. In the event a part of the WORK is to be entirely eliminated and no lump sum or unit price is named in the Contract Documents to cover such eliminated work, the price of the eliminated work shall be agreed upon in writing by the OWNER and the CONTRACTOR. If the OWNER and the CONTRACTOR fail to agree upon the price of the eliminated work, said price shall be determined in accordance with the provisions of Article 11.

ARTICLE 11 CHANGE OF CONTRACT PRICE

11.1 GENERAL

- A. The Contract Price constitutes the total compensation payable to the

CONTRACTOR for performing the WORK. All duties, responsibilities, and obligations assigned to or undertaken by the CONTRACTOR to complete the WORK shall be at its expense without change in the Contract Price. The CONTRACTOR bid the WORK and the Municipality accepted the bid as a not to exceed contract price. The Agreement is specifically not a time and materials contract.

- B. The Contract Price may only be changed by a written Change Order, approved by the Municipal Assembly or otherwise provided by municipal code. Any claim for an increase in the Contract Price shall be based on written notice delivered by the CONTRACTOR to the OWNER'S REPRESENTATIVE promptly (but in no event later than 30 days) after the start of the occurrence or the event giving rise to the claim and stating the specific nature of the claim and providing all supporting documents. Notice of the amount of the claim with supporting data shall be delivered within 60 days after such occurrence (unless the OWNER'S REPRESENTATIVE allows an additional period of time to ascertain more accurate data in support of the claim) and shall be accompanied by the CONTRACTOR's written statement that the amount claimed covers all known amounts for actual work to which the CONTRACTOR claims to be entitled as a result of the occurrence or event. All claims for adjustment in the Contract Price shall be determined by the OWNER'S REPRESENTATIVE in accordance with Paragraph 9.8A if the OWNER and the CONTRACTOR cannot otherwise agree on the amount involved. No claim for an adjustment in the Contract Price will be valid if not submitted in accordance with this Paragraph 11.1B. The Municipality reserves the right in its sole discretion to determine that a requested increase in the Contract Price comes within the agreed upon not to exceed amount in the Agreement without submittal of the claim to the OWNER'S REPRESENTATIVE, subject to the CONTRACTOR and OWNER'S rights under Section IX (k) of the Agreement.
- C. The value of any work covered by a Change Order or of any claim for an increase or decrease in the Contract Price shall be determined in one of the following ways:
1. Where the work involved is covered by unit prices contained in the Contract Documents, by application of unit prices to the quantities of the items involved.

2. By mutual acceptance of a lump sum for actual work performed
3. On the basis of the cost of work actually performed (determined as provided in Paragraphs 11.3) plus a CONTRACTOR's fee for overhead and profit (determined as provided in Paragraph 11.4). The cost of work actually performed shall not include mobilization and demobilization of equipment.

11.2 COSTS RELATING TO WEATHER. The CONTRACTOR shall have no claims against the OWNER for damages for any injury to work, materials, or equipment, resulting from the action of the elements. If, however, in the opinion of the OWNER'S REPRESENTATIVE, the CONTRACTOR has made all reasonable efforts to protect the materials, equipment and work, the CONTRACTOR may be granted a reasonable extension of Contract Time to make proper repairs, renewals, and replacements of the work, materials, or equipment.

11.3 COST OF WORK (BASED ON TIME AND MATERIALS)

- A. General. The term "cost of work" means the sum of all costs necessarily incurred and actually paid by the CONTRACTOR for labor, materials, and equipment in the proper performance of extra work. Except as otherwise may be agreed to in writing by the OWNER, such costs shall be in amounts no higher than those prevailing in the locality of the Project; shall include only the following items and shall not include any of the costs itemized in Paragraph 11.5 EXCLUDED COSTS.
- B. Labor. The costs of labor will be the actual cost for wages prevailing for each craft or type of workers performing the extra work at the time the extra work is done, plus employer payments of payroll taxes, worker's compensation insurance, liability insurance, health and welfare, pension, vacation, apprenticeship funds, and other direct costs actually incurred and paid. Labor costs for equipment operators and helpers shall be paid only when such costs are not included in the invoice for equipment rental. The labor costs for forepersons shall be proportioned to all of their assigned work and only that applicable to extra work shall be paid. Non-direct labor costs including superintendence shall be considered part of the mark-up set out in paragraph 11.4.
- C. Materials. The cost of materials reported shall be at invoice or lowest current

price at which materials are locally available and delivered to the job in the quantities involved, plus the cost of freight, delivery and storage, if incurred and paid, subject to the following:

1. Trade discounts available to the purchaser shall be credited to the OWNER notwithstanding the fact that such discounts may not have been taken by the CONTRACTOR.
2. For materials secured by other than a direct purchase and direct billing to the purchaser, the cost shall be deemed to be the price paid to the actual supplier as determined by the OWNER'S REPRESENTATIVE. Mark-up except for actual costs incurred in the handling of such materials will not be allowed.
3. Payment for materials from sources owned wholly or in part by the purchaser shall not exceed the price paid by the purchaser for similar materials from said sources on extra work items or the current wholesale price for such materials delivered to the work site, whichever price is lower.
4. If in the opinion of the OWNER'S REPRESENTATIVE the cost of material is excessive, or the CONTRACTOR does not furnish satisfactory documentation of the actual cost of such material, then the cost shall be deemed to be the lowest current wholesale price for the quantity concerned delivered to the work site less trade discount. The OWNER reserves the right to furnish materials for the extra work and no claim shall be allowed by the CONTRACTOR for costs and profit on materials furnished by the OWNER.

- D. Equipment. The CONTRACTOR will be paid for the use of equipment only as to the claimed additional work, at the rental rate listed for such equipment specified in the Supplementary General Conditions. Such rental rate will be used to compute payments for equipment whether the equipment is under the CONTRACTOR's control through direct ownership, leasing, renting, or another method of acquisition. The rental rate to be applied for use of each item of equipment shall be the rate resulting in the least total cost to the OWNER for the total period of use. If it is deemed necessary by the CONTRACTOR to use equipment not listed in the publication specified in the Supplementary General Conditions, an equitable rental rate for the equipment will be established by the OWNER'S REPRESENTATIVE. The CONTRACTOR may furnish cost data which might assist the OWNER'S

REPRESENTATIVE in the establishment of the rental rate. No mobilization or demobilization costs will be allowed under this section.

1. All equipment shall, in the opinion of the OWNER'S REPRESENTATIVE, be in good working condition and suitable for the purpose for which the equipment is to be used.
2. Before construction equipment is used on the extra work, the CONTRACTOR shall plainly stencil or stamp an identifying number on the equipment at a conspicuous location, and shall furnish to the OWNER'S REPRESENTATIVE, in duplicate, a description of the equipment and its identifying number.
3. Unless otherwise specified, manufacturer's ratings and manufacturer approved modifications shall be used to classify equipment for the determination of applicable rental rates. Equipment which has no direct power unit shall be powered by a unit of at least the minimum rating recommended by the manufacturer.
4. Individual pieces of equipment or tools having a replacement value of \$200 or less, whether or not consumed by use, shall be considered to be small tools and no payment will be made for their use.
5. Rental time will not be allowed while equipment is inoperative due for any reason.
6. Equipment Rental Rates. Unless otherwise agreed in writing, the CONTRACTOR will be paid for the actual use of equipment at the rental rate listed for such equipment specified in the current edition of the following reference publication: "Rental Rate Blue Book" as published by Dataquest (a company of the Dunn and Bradstreet Corporation), 1290 Ridder Park Drive, San Jose, CA 95131, telephone number (800) 227-8444. No mobilization or demobilization shall be allowed under this section.

- E. Equipment on the Work Site. The rental time to be paid for equipment on the work site shall be the time the equipment is in productive operation solely on the extra work being performed and, in addition, shall include the time required to move the equipment to the location of the extra work and return it to the original location or to another location requiring no more time than that required to return it to its original location, only if the equipment is transported to Skagway solely for the purpose of the additional work, and there is no other equipment in Skagway capable of being used for the claimed

additional work, and is then used solely on the extra work; except, that moving time will not be paid if the equipment is used on other than the extra work, even though located at the site of the extra work. Loading and transporting costs will be allowed, in lieu of moving time, when the equipment is moved by means other than its own power, except that no payment will be made for loading and transporting costs when the equipment is used at the site of the extra work on other than the extra work. The following shall be used in computing the rental time of equipment on the work site.

1. When hourly rates are listed, any part of an hour less than 30 minutes of operation shall be considered to be 1/2-hour of operation, and any part of an hour in excess of 30 minutes will be considered one hour of operation.
2. When daily rates are listed, any part of a day less than 4 hours operation shall be considered to be 1/2-day of operation. When owner-operated equipment is used to perform extra work to be paid for on a time and materials basis, the CONTRACTOR will be paid for the equipment and operator, as set forth in Paragraphs (3), (4).
3. Payment for the equipment will be made in accordance with the provisions in Paragraph 11.3D, herein.
4. To the direct cost of equipment rental and labor, computed as provided herein, will be added the allowances for equipment rental and labor as provided in Paragraph 11.4, herein.

F. Specialty Work. Specialty work is defined as that work characterized by extraordinary complexity, sophistication, or innovation or a combination of the foregoing attributes which are unique to the construction industry. The following shall apply in making estimates for payment for specialty work:

1. Any bid item of WORK to be classified as Specialty Work shall be listed as such in the Supplementary General Conditions. Specialty work shall be performed by an entity especially skilled in the work to be performed. After validation of invoices and determination of market values by the OWNER'S REPRESENTATIVE, invoices for specialty work based upon the current fair market value thereof may be accepted without complete itemization of labor, material, and equipment rental costs.

2. When the CONTRACTOR is required to perform work necessitating special fabrication or machining process in a fabrication or a machine shop facility away from the job site, the charges for that portion of the work performed at the off-site facility may, by agreement, be accepted as specialty work and accordingly, the invoices for the work may be accepted without detailed itemization.
 3. All invoices for specialty work will be adjusted by deducting all trade discounts offered or available, whether the discounts were taken or not. In lieu of the allowances for overhead and profit specified in Paragraph 11.4, herein, an allowance of 5 percent will be added to invoices for specialty work.
- G. Sureties. All work performed hereunder shall be subject to all of the provisions of the Contract Documents and the CONTRACTOR's sureties shall be bound with reference thereto as under the original Agreement. Copies of all amendments to surety bonds or supplemental surety bonds shall be submitted to the OWNER for review prior to the performance of any work hereunder.

11.4 CONTRACTOR'S FEE

- A. Extra work ordered on the basis of time and materials will be paid for at the actual necessary cost as determined by the OWNER'S REPRESENTATIVE. CONTRACTOR shall not be entitled to overhead if determined by the OWNER to be within the not to exceed bid amount in the Agreement. If allowed by the OWNER, allowance for overhead and profit will be made in accordance with the following schedule:

Actual Overhead and Profit Allowance

Labor	15 percent
Materials	10 percent
Equipment	10 percent

To the sum of the costs and mark-ups provided for in this Article, 1% shall be added as compensation for bonding.

11.5 EXCLUDED COSTS. The term "Cost of the Work" shall not include any of the

following:

- A. Payroll costs and other compensation of CONTRACTOR's officers, executives, principals (of partnership and sole proprietorships), general managers, OWNER's Representatives, estimators, attorneys' auditors, accountants, purchasing and contracting agents, expenditures, timekeepers, clerks and other personnel employed by CONTRACTOR whether at the site or in CONTRACTOR's principal or a branch office for general administration of the Work, or not specifically covered by paragraph 11.3, all of which are to be considered administrative costs covered by the CONTRACTOR's fee.
- B. Expenses of CONTRACTOR's principal and branch offices other than CONTRACTOR's office at the site.
- C. Any part of CONTRACTOR's capital expenses, including interest on CONTRACTOR's capital employed for the Work and charges against CONTRACTOR for delinquent payments.
- D. Cost of premiums for all bonds and for all insurance whether or not CONTRACTOR is required by the Contract Documents to purchase and maintain the same (except for the cost of premiums covered by paragraph 11.4 above).
- E. Costs due to the negligence of or omissions of the CONTRACTOR , any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied and making good any damage to property.
- F. Other overhead or general expense costs of any kind and the cost of any item not specifically and expressly included in paragraph 11.4.
- G. Mobilization and demobilization of equipment on site.

ARTICLE 12 CHANGE OF CONTRACT TIME

12.1 GENERAL

- A. The Contract Time may only be changed by a written Change Order. Any claim for an extension of the Contract Time (or Milestones) shall be based on written notice delivered by the CONTRACTOR to the OWNER'S REPRESENTATIVE promptly (but in no event later than 30 days) after the occurrence of the event giving rise to the claim and stating the general nature of the claim. Notice of the extent of the claim with supporting data shall be delivered within 60 days after such occurrence (unless the OWNER'S REPRESENTATIVE allows an additional period of time to ascertain more accurate data in support of the claim) and shall be accompanied by the CONTRACTOR'S written statement that the adjustment claimed is the entire adjustment to which the CONTRACTOR has reason to believe it is entitled as a result of the occurrence of said event. All claims for adjustment in the Contract Time shall be determined by the OWNER'S REPRESENTATIVE in accordance with Paragraph 9.8 if the OWNER and the CONTRACTOR cannot otherwise agree. No claim for an adjustment in the Contract Time will be valid if not submitted in accordance with the requirements of this Paragraph 12.1A. An increase in Contract Time does not mean that the Contractor is due an increase in Contract Price. Only Compensable time extensions will result in an increase in Contract Price.
- B. All time limits stated in the Contract Documents are of the essence of the Agreement.
- C. Where CONTRACTOR is prevented from completing any part of the Work within the Contract Times (or Milestones) due to delay beyond the control of CONTRACTOR, the Contract Times (or Milestones) may be extended in an amount equal to the time lost on the critical path of the project due to such delay if a claim is made as provided in paragraph 12.1. Delays beyond the control of CONTRACTOR which may be considered by the OWNER include, but not be necessarily limited to, negligent acts of the OWNER of which the OWNER agrees, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, unprecedented weather conditions not reasonably expected in Skagway, Alaska or acts of God. Delays attributable to and within the control

of a Subcontractor or Supplier shall be deemed to be delays within the control of CONTRACTOR.

- D. Where CONTRACTOR is prevented from completing any part of the Work within the Contract Times (or Milestones) due to delay beyond the control of both OWNER and CONTRACTOR, an extension of the Contract Times (or Milestones) in an amount equal to the time lost on the critical path of the project due to such delay shall be CONTRACTOR's sole and exclusive remedy for such delay. In no event shall the OWNER be liable to CONTRACTOR, any Subcontractor, any Supplier, or any other person or organization, or to any surety for or employee or agent of any of them, for damages arising out of or resulting from (i) delays caused by or within the control of CONTRACTOR, or (ii) delays beyond the control of both parties including but not limited to fires, floods, epidemics abnormal weather conditions, acts of God or acts or neglect by utility owners or other contractors performing other work as contemplated by Article 7.
- 12.2 EXTENSIONS OF TIME FOR DELAY DUE TO WEATHER. Contract time may be extended by the OWNER'S REPRESENTATIVE because of delays in completion of the work due to unusually severe weather not reasonably foreseeable for Skagway, Alaska, provided that the Contractor shall, within 10 days of the beginning of any such delay, notify the OWNER'S REPRESENTATIVE in writing of the cause of delay and request an extension of contract time. The OWNER'S REPRESENTATIVE will ascertain the facts and the extent of the delay and extend the time for completing the work when, in the OWNER'S REPRESENTATIVE's judgment, the findings of fact justify such an extension. Unprecedented, abnormal, or unusually severe weather for Skagway, Alaska will be defined as an event, or events, with a greater than 50-year recurrence interval, as determined by the National Weather Service, or equivalent State or Federal agency.

ARTICLE 13 WARRANTY AND GUARANTEE; TESTS AND INSPECTIONS; CORRECTION, REMOVAL, OR ACCEPTANCE OF DEFECTIVE WORK

- 13.1 WARRANTY AND GUARANTEE. The CONTRACTOR warrants and guarantees to the OWNER and the OWNER'S REPRESENTATIVE that all work will be in accordance with the Contract Documents and will not be defective. Prompt notice of defects known to the OWNER or OWNER'S REPRESENTATIVE shall be given to the CONTRACTOR. All defective work, whether or not in place, may be rejected,

corrected, or accepted as provided in this Article 13.

13.2 ACCESS TO WORK. OWNER, OWNER'S REPRESENTATIVE, their Consultants, sub-consultants, other representatives and personnel of OWNER, independent testing laboratories and governmental agencies with jurisdictional interests will have access to the Work at reasonable times for their observation, inspecting and testing. CONTRACTOR shall provide them proper and safe conditions for such access and advise them of CONTRACTOR's site safety procedures and programs so that they may comply therewith as applicable.

13.3 TESTS AND INSPECTIONS

- A. The CONTRACTOR shall give the OWNER'S REPRESENTATIVE timely notice of readiness of the WORK for all required inspections, tests, or approvals, and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.
- B. If Laws or Regulations of any public agency or governing body having jurisdiction other than the OWNER require any work to specifically be inspected, tested, or approved, the CONTRACTOR shall pay all costs in connection therewith. The CONTRACTOR shall also be responsible for and shall pay all costs in connection with any inspection or testing required in connection with the OWNER's or the OWNER'S REPRESENTATIVE's acceptance of a Supplier of materials or equipment proposed as a substitution or (or-equal) to be incorporated in the WORK, or of materials or equipment submitted for review prior to the CONTRACTOR's purchase thereof for incorporation in the WORK. The cost of all inspections, tests, and approvals in addition to the above which are required by the Contract Documents shall be paid by the OWNER (unless otherwise specified).
- C. The OWNER'S REPRESENTATIVE will make, or have made, such inspections and tests as the OWNER'S REPRESENTATIVE deems necessary to see that the WORK is being accomplished in accordance with the requirements of the Contract Documents. Unless otherwise specified in the Supplementary General Conditions, the cost of such inspection and testing will be borne by the OWNER. In the event such inspections or tests reveal non-compliance with the requirements of the Contract Documents, the

CONTRACTOR shall bear the cost of corrective measures deemed necessary by the OWNER'S REPRESENTATIVE, as well as the cost of subsequent reinspection and retesting. Neither observations by the OWNER'S REPRESENTATIVE nor inspections, tests, or approvals by others shall relieve the CONTRACTOR from the CONTRACTOR's obligation to perform the WORK in accordance with the Contract Documents.

- D. All inspections, tests, or approvals other than those required by Laws or Regulations of any public body having jurisdiction shall be performed by organizations acceptable to the OWNER'S REPRESENTATIVE and the CONTRACTOR.
- E. If any work (including the work of others) that is to be inspected, tested, or approved is covered without written concurrence of the OWNER'S REPRESENTATIVE, it must, if requested by the OWNER'S REPRESENTATIVE, be uncovered for observation. Such uncovering shall be at the CONTRACTOR's expense unless the CONTRACTOR has given the OWNER'S REPRESENTATIVE timely notice of the CONTRACTOR's intention to perform such test or to cover the same and the OWNER'S REPRESENTATIVE has not acted with reasonable promptness in response to such notice.
- F. If any work is covered contrary to the written request of the OWNER'S REPRESENTATIVE, it must, if requested by the OWNER'S REPRESENTATIVE, be uncovered for the OWNER'S REPRESENTATIVE's observation and recovered at the CONTRACTOR's expense.
- G. If the OWNER'S REPRESENTATIVE considers it necessary or advisable that covered work be observed by the OWNER'S REPRESENTATIVE or inspected or tested by others, the CONTRACTOR, at the OWNER'S REPRESENTATIVE's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as the OWNER'S REPRESENTATIVE may require, that portion of the WORK in question, furnishing all necessary labor, material, and equipment. If it is found that such work is defective, the CONTRACTOR shall bear all direct, indirect, and consequential costs and damages of such uncovering, exposure, observation, inspection, and testing and of satisfactory reconstruction, including but not

limited to fees and charges of OWNER's Representatives, attorneys, and other professionals. However, if such work is not found to be defective by the OWNER'S REPRESENTATIVE, the CONTRACTOR shall be compensated by change order for the actual cost of work performed to the uncovering, exposure, observation, inspection, testing, and reconstruction; and, if the parties are unable to agree as to the amount of the actual cost of the work the CONTRACTOR may make a claim therefor as provided in Articles 11 and 12.

- 13.4 OWNER MAY STOP THE WORK. If the WORK is defective, or the CONTRACTOR fails to perform work in such a way that the completed WORK will conform to the Contract Documents, the OWNER may order the CONTRACTOR to stop the WORK, or any portion thereof, until the cause for such order has been eliminated; however, this right of the OWNER to stop the WORK shall not give rise to any duty on the part of the OWNER to exercise this right for the benefit of the CONTRACTOR or any other party.
- 13.5 CORRECTION OR REMOVAL OF DEFECTIVE WORK. If required by the OWNER'S REPRESENTATIVE, the CONTRACTOR shall promptly, either correct all defective work, whether or not fabricated, installed, or completed, or, if the WORK has been rejected by the OWNER'S REPRESENTATIVE, remove it from the site and replace it with non-defective work. The CONTRACTOR shall bear all direct, indirect and consequential costs and damages of such correction or removal, including but not limited to fees and charges of OWNER's Representatives, attorneys, and other professionals made necessary thereby.
- 13.6 ONE YEAR CORRECTION PERIOD
- A. If within one year after the date of Substantial Completion or such longer period of time as may be prescribed by Laws or Regulations or by the terms of any applicable special guarantee required by the Contract Documents or by any specific provision of the Contract Documents, any work is found to be defective, the CONTRACTOR shall promptly, without cost to the OWNER and in accordance with OWNER's written notification, (i) correct such defective work, or, if it has been rejected by the OWNER, remove it from the site and replace it with non-defective work, and (ii) satisfactorily correct or remove and replace any damage to other work of others resulting therefrom. If the CONTRACTOR does not promptly comply with such notification, or

in an emergency where delay would cause serious risk of loss or damage, or where the defective work is or may result in a loss of revenue to the OWNER, the OWNER may have the defective work corrected or the rejected work removed and replaced, and all direct, indirect, and consequential costs and damages of such removal and replacement including but not limited to fees and charges of OWNER'S Representatives, attorneys and other professionals and the OWNER'S loss of revenue shall be paid by the CONTRACTOR immediately upon presentation of the cost and other expenses and losses by the OWNER.

- B. Where defective Work (and damage to other Work resulting therefrom) has been corrected, removed or replaced under this paragraph 13.6, the correction period with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.
- 13.7 ACCEPTANCE OF DEFECTIVE WORK. If, instead of requiring correction or removal and replacement of defective work, the OWNER prefers to accept the work, the OWNER may do so. The CONTRACTOR shall bear all direct, indirect, and consequential costs attributable to the OWNER's evaluation of and determination to accept such defective work. If any such acceptance occurs prior to final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the WORK, and the OWNER shall be entitled to a corresponding decrease in the Contract Price.

ARTICLE 14 PAYMENTS TO CONTRACTOR AND COMPLETION

- 14.1 SCHEDULE OF VALUES (LUMP SUM PRICE BREAKDOWN). The schedule of values or lump sum price breakdown established as provided in the General Requirements Section 001025 Measurement and Payment shall serve as the basis for progress payments based on percentage of unit value completed and will be incorporated into a form of Application for Payment acceptable to the OWNER'S REPRESENTATIVE.
- 14.2 UNIT PRICE BID SCHEDULE. Progress payments on account of Unit Price work will be based on the number of units completed.

14.3 APPLICATION FOR PROGRESS PAYMENT

- A. Unless otherwise prescribed by law, on the 20th of each month, the CONTRACTOR shall submit to the OWNER'S REPRESENTATIVE for review, an Application for Payment filled out and signed by the CONTRACTOR covering the WORK completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents.
- B. The Application for Payment shall identify, as a sub-total, the amount of the CONTRACTOR'S Total Earnings to Date, plus the Value of Materials Stored at the Site which have not yet been incorporated in the WORK, and less a deductive adjustment for materials installed which were not previously incorporated in the WORK, but for which payment was allowed under the provisions for payment for Materials Stored at the Site, but not yet incorporated in the WORK.
- C. The Net Payment Due the CONTRACTOR shall be the above-mentioned subtotal from which shall be deducted the total amount of all previous payments made to the CONTRACTOR. Progress payments will be paid in full in accordance with Article 14 of the General Conditions. Final payment we be received upon receipt of all close out documents.
 - 1. Final inspection has been made;
 - 2. Completion of the project;
 - 3. Acceptance of the project by the owner and;
 - 4. The owner has received notification from the Alaska Department Of Labor that the CONTRACTOR has no outstanding wage/hour violations.
- D. The Value of Materials Stored at the Site shall be an amount equal to the specified percent of the value of such materials as set forth in the Supplementary General Conditions. Said amount shall be based upon the value of all acceptable materials and equipment not incorporated in the WORK but delivered and suitably stored at the site or at another location agreed to in writing; provided, each such individual item has a value of more than \$5,000.00 and will become a permanent part of the WORK. The Application for Payment shall also be accompanied by an invoice (including

shipping), a certification that the materials meet the applicable contract specifications, and any evidence required by the OWNER that the materials and equipment are covered by appropriate property insurance and other arrangements to protect the OWNER's interest therein, all of which will be satisfactory to the OWNER. Payment for materials will not constitute final acceptance. It shall be the Contractor's responsibility to protect the material from damage, theft, loss, or peril while in storage. Unless otherwise prescribed by law, the Value of Materials Stored at the Site shall be paid at the invoice amount up to a maximum of 85% of the Contract Price for those items.

14.4 CONTRACTOR'S WARRANTY OF TITLE. The CONTRACTOR warrants and guarantees that title to all work, materials, and equipment covered by an Application for Payment, whether incorporated in the WORK or not, will pass to the OWNER no later than the time of payment free and clear of all liens.

14.5 REVIEW OF APPLICATIONS FOR PROGRESS PAYMENT

- A. The OWNER'S REPRESENTATIVE will, within 7 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to the OWNER, or return the Application to the CONTRACTOR indicating in writing the OWNER'S REPRESENTATIVE's reasons for refusing to recommend payment. In the later case, the CONTRACTOR may make the necessary corrections and resubmit the Application. If the OWNER'S REPRESENTATIVE still disagrees with a portion of the Application, it will submit the Application recommending the undisputed portion of the Application to the OWNER for payment and provide reasons for recommending non-payment of the disputed amount. Thirty days after presentation of the Application for Payment with the OWNER'S REPRESENTATIVE's recommendation, the amount recommended will (subject to the provisions of Paragraph 14.5B) become due and when due will be paid by the OWNER to the CONTRACTOR. The Application for Payment shall certify that the CONTRACTOR has no claims nor is aware of any possible claims for any additional payment or increase in the time.
- B. The OWNER may refuse to make payment of the full amount recommended by the OWNER'S REPRESENTATIVE because claims have been made

against the OWNER on account of the CONTRACTOR's performance of the WORK or Liens have been filed in connection with the WORK or there are other items entitling the OWNER to a credit against the amount recommended, but the OWNER must give the CONTRACTOR written notice within 7 days (with a copy to the OWNER'S REPRESENTATIVE) stating the reasons for such action.

14.6 PARTIAL UTILIZATION

- A. The OWNER shall have the right to utilize or place into service any item of equipment or other usable portion of the WORK prior to completion of the WORK. Whenever the OWNER plans to exercise said right, the CONTRACTOR will be notified in writing by the OWNER, identifying the specific portion or portions of the WORK to be so utilized or otherwise placed into service.
- B. It shall be understood by the CONTRACTOR that until such written notification is issued, all responsibility for care and maintenance of all of the WORK shall be borne by the CONTRACTOR. Upon issuance of said written notice of partial utilization, the OWNER will accept responsibility for the protection and maintenance of all such items or portions of the WORK described in the written notice.
- C. The CONTRACTOR shall retain full responsibility for satisfactory completion of the WORK, regardless of whether a portion thereof has been partially utilized by the OWNER and the CONTRACTOR's one year correction period shall commence only after the date of Substantial Completion for the WORK.

14.7 SUBSTANTIAL COMPLETION. When the CONTRACTOR considers the WORK ready for its intended use the CONTRACTOR shall notify the OWNER and the OWNER'S REPRESENTATIVE in writing that the WORK is substantially complete. The CONTRACTOR will attach to this request a list of all work items that remain to be completed and a request that the OWNER'S REPRESENTATIVE prepare a Notice of Completion. Within a reasonable time thereafter, the OWNER, the CONTRACTOR, and the OWNER'S REPRESENTATIVE shall make an

inspection of the WORK to determine the status of completion. If the OWNER'S REPRESENTATIVE does not consider the WORK substantially complete, or the list of remaining work items to be comprehensive, the OWNER'S REPRESENTATIVE will notify the CONTRACTOR in writing giving the reasons. If the OWNER'S REPRESENTATIVE considers the WORK substantially complete, the OWNER'S REPRESENTATIVE will prepare and deliver to the OWNER, for its execution and recording, the Notice of Completion signed by the OWNER'S REPRESENTATIVE and CONTRACTOR, which shall fix the date of Substantial Completion.

14.8 FINAL APPLICATION FOR PAYMENT. After the CONTRACTOR has completed all of the remaining work items referred to in Paragraph 14.7 and delivered all maintenance and operating instructions, schedules, guarantees, Bonds, certificates of inspection, record as-built documents (as provided in the General Requirements) and other documents, all as required by the Contract Documents, and after the OWNER'S REPRESENTATIVE has indicated that the WORK is acceptable, the CONTRACTOR may make application for final payment following the procedure for progress payments. The final Application for Payment shall be accompanied by all documentation called for in the Contract Documents, together with complete and legally effective releases or waivers (satisfactory to the OWNER) of all liens arising out of or filed in connection with the WORK and certification that the CONTRACTOR has no claims against the OWNER.

14.9 FINAL PAYMENT AND ACCEPTANCE

- A. If, on the basis of the OWNER'S REPRESENTATIVE's observation of the WORK during construction and final inspection, and the OWNER'S REPRESENTATIVE's review of the final Application for Payment and accompanying documentation, all as required by the Contract Documents, the OWNER'S REPRESENTATIVE is satisfied that the WORK has been completed and the CONTRACTOR's other obligations under the Contract Documents have been fulfilled, the OWNER'S REPRESENTATIVE will, within 14 days after receipt of the final Application for Payment, indicate in writing the OWNER'S REPRESENTATIVE's recommendation of payment and present the Application to the OWNER for payment.
- B. After acceptance of the WORK by the OWNER's governing body, the OWNER will make final payment to the CONTRACTOR of the amount remaining after deducting all prior payments and all amounts to be kept or

retained under the provisions of the Contract Documents, including the following items:

1. Liquidated damages, as applicable.
2. Two times the value of outstanding items of correction work or punch list items yet uncompleted or uncorrected, as applicable. All such work shall be completed or corrected to the satisfaction of the OWNER within the time stated on the Notice of Completion, otherwise the CONTRACTOR does hereby waive any and all claims to all monies withheld by the OWNER to cover the value of all such uncompleted or uncorrected items.

14.10 RELEASE OF RETAINAGE AND OTHER DEDUCTIONS

- A. After executing the necessary documents to initiate the lien period, and not more than 45 days thereafter (based on a 30-day lien filing period and 15-day processing time), the OWNER will release to the CONTRACTOR the retainage funds withheld pursuant to the Agreement, less any deductions to cover pending claims against the OWNER pursuant to Paragraph 14.5B.
- B. After filing of the necessary documents to initiate the lien period, the CONTRACTOR shall have 30 days to complete any outstanding items of correction work remaining to be completed or corrected as listed on a final punch list made a part of the Notice of Completion. Upon expiration of the 45 days, referred to in Paragraph 14.10A, the amounts withheld pursuant to the provisions of Paragraph 14.9B herein, for all remaining work items will be returned to the CONTRACTOR; provided, that said work has been completed or corrected to the satisfaction of the OWNER within said 30 days. Otherwise, the CONTRACTOR does hereby waive any and all claims for all monies withheld by the OWNER under the Contract to cover 2 times the value of such remaining uncompleted or uncorrected items.

14.11 CONTRACTOR'S CONTINUING OBLIGATION. The CONTRACTOR's obligation to perform and complete the WORK in accordance with the Contract Documents shall be absolute. Neither recommendation of any progress or final payment by the OWNER'S REPRESENTATIVE, nor the issuance of a Notice of Completion, nor any payment by the OWNER to the CONTRACTOR under the Contract Documents, nor any use or occupancy of the WORK or any part thereof by

the OWNER, nor any act of acceptance by the OWNER nor any failure to do so, nor any review of a Shop Drawing or sample submittal, will constitute an acceptance of work not in accordance with the Contract Documents or a release of the CONTRACTOR's obligation to perform the WORK in accordance with the Contract Documents.

- 14.12 FINAL PAYMENT TERMINATES LIABILITY OF OWNER. Final payment is defined as the last progress payment made to the CONTRACTOR for earned funds, less monies withheld as applicable, pursuant to Paragraph 14.10A. The acceptance by the CONTRACTOR of the final payment referred to in Paragraph 14.9 herein, shall be a release of the OWNER and its agents from all claims of liability to the CONTRACTOR for anything done or furnished for, or relating to, the WORK or for any act of neglect of the OWNER or of any person relating to or affecting the WORK, except demands against the OWNER for the remainder, if any, of the amounts kept or retained under the provisions of Paragraph 14.9 herein; and excepting pending, unresolved claims filed prior to the date of the Notice of Completion.

ARTICLE 15 SUSPENSION OF WORK AND TERMINATION

- 15.1 SUSPENSION OF WORK BY OWNER. The OWNER, acting through the OWNER'S REPRESENTATIVE, may, at any time and without cause, suspend the WORK or any portion thereof for a period of not more than 90 days by notice in writing to the CONTRACTOR. The CONTRACTOR shall resume the WORK on receipt from the OWNER'S REPRESENTATIVE of a notice of resumption of work. The CONTRACTOR shall be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to any suspension if the CONTRACTOR makes an approved claim therefor as provided in Articles 11 and 12.
- 15.2 TERMINATION OF AGREEMENT BY OWNER (CONTRACTOR DEFAULT)
- A. In the event of default by the CONTRACTOR, the OWNER may give 10 days written notice to the CONTRACTOR of OWNER's intent to terminate the Agreement and provide the CONTRACTOR an opportunity to remedy the conditions constituting the default. It shall be considered a default by the CONTRACTOR whenever CONTRACTOR shall: (1) declare bankruptcy, become insolvent, or assign its assets for the benefit of its creditors; (2) fail to

provide materials or quality of work meeting the requirements of the Contract Documents; (3) disregard or violate provisions of the Contract Documents or OWNER'S REPRESENTATIVE's instructions; (4) fail to prosecute the WORK according to the approved progress schedule; or, (5) fail to provide a qualified superintendent, competent workers, or materials or equipment meeting the requirements of the Contract Documents; or 6) create any safety risk on the job site or to the community which upon notification of, the CONTRACTOR refuses to address and correct within 3 days of the written notification. If the CONTRACTOR fails to remedy the conditions constituting default within the time allowed, the OWNER may then issue the Notice of Termination.

- B. In the event the Agreement is terminated in accordance with Paragraph 15.2A, herein, the OWNER may take possession of the WORK and may complete the WORK by whatever method or means the OWNER may select. The cost of completing the WORK shall be deducted from the balance which would have been due the CONTRACTOR had the Agreement not been terminated and the WORK completed in accordance with the Contract Documents. If such cost exceeds the balance which would have been due, the CONTRACTOR shall pay the excess amount to the OWNER. If such cost is less than the balance which would have been due, the CONTRACTOR shall not have claim to the difference. The CONTRACTOR'S claim shall be limited to the cost of work actually performed to the date of the termination.
- 15.3 TERMINATION OF AGREEMENT BY OWNER (FOR CONVENIENCE). The Municipality reserves the right to terminate the services of the CONTRACTOR at any time when the Municipality determines that termination is in the best interests of the Municipality. If the Municipality terminates the contract pursuant to this section, the Municipality shall notify the CONTRACTOR in writing as of the effective date to stop work and the CONTRACTOR shall immediately stop all work, including providing direction to subcontractors to stop and to cease from ordering any materials or supplies for the Project. Upon termination pursuant to this section, CONTRACTOR shall have sixty (60) days to submit any and all claims to the Municipality for any unpaid work actually performed by the CONTRACTOR before the date of termination and for which the CONTRACTOR has not been paid, together with all back-up documentation in support of the claim. "Unpaid work" is defined as actual work performed in accordance with the specifications and project schedule and "unpaid work" is specifically not to include the costs of the work to the

CONTRACTOR. The failure of the CONTRACTOR to submit a claim within 60 days forever waives any claim by the CONTRACTOR based upon the Municipality's termination for any payment for work claimed by the CONTRACTOR to have not been paid as of the date of termination. CONTRACTOR and the Municipality agree to make a good faith effort to resolve any claim submitted by the CONTRACTOR pursuant to this section within thirty days (30) of receipt by the Municipality, unless that time is otherwise extended by the parties in writing. If the parties fail to reach an agreement on payment to the CONTRACTOR within the 30 days, the Municipality shall pay the amount determined by the Municipality to be fair and reasonable, based on the back-up documents provided by the CONTRACTOR and the Municipality's records. In the event the parties do not reach agreement, the CONTRACTOR may pursue its remedies pursuant to Section IX (k) of the Agreement, unless the CONTRACTOR failed to submit the claim within 60 days of termination.

- 15.4 **TERMINATION OF AGREEMENT BY CONTRACTOR.** The CONTRACTOR may terminate the Agreement upon 20 days written notice to the OWNER, whenever: 1) the WORK has been suspended under the provisions of Paragraph 15.1, herein, for more than 90 consecutive days through no fault or negligence of the CONTRACTOR, and notice to resume work or to terminate the Agreement has not been received from the OWNER within this time period, after being requested by the CONTRACTOR in writing; or, 2) the OWNER should fail to pay the CONTRACTOR any monies due them for work actually performed in accordance with the terms of the Contract Documents and within 60 days after presentation to the OWNER by the CONTRACTOR of the written request, unless the OWNER shall have remedied the condition upon which the payment delay was based within 20 days of presentation of the written 60 day notice or unless the CONTRACTOR has submitted claims against the OWNER. In the event of such termination, the CONTRACTOR shall have no claims against the OWNER except for those claims specifically enumerated in Paragraph 15.3.

ARTICLE 16 MISCELLANEOUS

- 16.1 **GIVING NOTICE.** Whenever any provision of the Contract Documents requires the giving of written notice. The written notice shall be electronically delivered to the authorized Owners Representative or as otherwise authorized in writing by the owner and acknowledged at the subsequent project progress meeting.

16.2 RIGHTS IN AND USE OF MATERIALS FOUND ON THE WORK

- A. The CONTRACTOR shall replace, at its own expense, with other acceptable material, all of that portion of the excavated material so removed and used which was needed for use on the project. No charge for the materials so used will be made against the CONTRACTOR except that the CONTRACTOR shall be responsible for payment of any royalties required.
 - B. The CONTRACTOR shall not excavate or remove any material from within the project location which is not within the grading limits, as indicated by the slope and grade lines, without written authorization from the OWNER'S REPRESENTATIVE.
 - C. In the event the CONTRACTOR has processed materials from Owner-furnished sources in excess of the quantities required for performance of this contract, including any waste material produced as a by-product, the MUNICIPALITY OF SKAGWAY may retain possession of such materials without obligation to reimburse the CONTRACTOR for the cost of their production. When such materials are in a stockpile, the OWNER'S REPRESENTATIVE may require: That it remain in stockpile; the CONTRACTOR level such stockpile(s); or that the CONTRACTOR remove such materials and restore the premises to a satisfactory condition at the CONTRACTOR's expense. This provision shall not preclude the MUNICIPALITY OF SKAGWAY from arranging with the CONTRACTOR to produce material over and above the contract needs, payment for which shall be by written agreement between the MUNICIPALITY OF SKAGWAY and the CONTRACTOR.
 - D. Unless otherwise provided, the material from any existing old structure may be used temporarily by the CONTRACTOR in the erection of the new structure. Such material shall not be cut or otherwise damaged except with the approval of the OWNER'S REPRESENTATIVE.
- 16.3 RIGHT TO AUDIT. If the CONTRACTOR submits a claim to the OWNER for additional compensation, the OWNER shall have the right, as a condition to considering the claim, and as a basis for evaluation of the claim, and until the claim has been settled, to audit the CONTRACTOR's books as related to the Project. This

- right shall include the right to examine books, records, documents, and other evidence and accounting procedures and practices, to discover and verify all direct and indirect costs of whatever nature claimed to have been incurred or anticipated to be incurred and for which the claim has been submitted. The right to audit shall include the right to inspect the CONTRACTOR's plants, , as may be or have been engaged in the performance of the WORK. The CONTRACTOR further agrees that the right to audit encompasses all subcontracts and is binding upon subcontractors. The rights to examine and inspect herein provided for shall be exercisable through such representatives as the OWNER deems desirable during the CONTRACTOR's normal business hours at the office of the CONTRACTOR. The CONTRACTOR shall make available to the OWNER for auditing, all accounting records and documents, and other financial data, related to the Project and upon request, shall submit true copies of requested records to the OWNER within 10 days of the request.
- 16.4 **ARCHAEOLOGICAL OR HISTORICAL DISCOVERIES.** When the CONTRACTOR's operation encounters prehistoric artifacts, burials, remains of dwelling sites, paleontological remains, such as shell heaps, land or sea mammal bones or tusks, or other items of historical significance, the CONTRACTOR shall cease operations immediately and notify the OWNER'S REPRESENTATIVE. No artifacts or specimens shall be further disturbed or removed from the ground and no further operations shall be performed at the site until so directed. Should the OWNER'S REPRESENTATIVE order suspension of the CONTRACTOR's operations in order to protect an archaeological or historical finding, or order the CONTRACTOR to perform extra work, such order(s) shall be covered by an appropriate contract change document.
- 16.5 **CONSTRUCTION OVER OR ADJACENT TO NAVIGABLE WATERS.** All work over, on, or adjacent to navigable waters shall be so conducted that free navigation of the waterways will not be interfered with and the existing navigable depths will not be impaired, except as allowed by permit issued the U.S. Coast Guard and/or the U.S. Army Corps, as applicable.
- 16.6 **GRATUITY AND CONFLICT OF INTEREST.** The CONTRACTOR agrees to not extend any loan, gratuity, or gift of money of any form whatsoever to any employee or elected official of the OWNER, nor will the CONTRACTOR rent or purchase any equipment or materials from any employee or elected official of the OWNER, or to the best of the CONTRACTOR's knowledge, from any agent of any employee or elected official of the OWNER. CONTRACTOR shall not employ any current

employee of the Municipality and shall not employ any elected official of the Municipality, either directly or as a subcontractor or consultant. Before final payment, the CONTRACTOR shall execute and furnish the OWNER an affidavit certifying that the CONTRACTOR has complied with the above provisions of the Contract.

16.7 SUITS OF LAW CONCERNING THE WORK

- A. CLIENT and ENGINEER agree to negotiate all disputes between them in good faith for a period of 30 days from the date of notice prior to invoking the procedures of 16.7.C or 16.7.D below.
- B. If the parties fail to resolve a dispute through negotiation under 16.7.A, then either or both may invoke the procedures of Paragraph 16.7.C
- C. Mediation. CLIENT and ENGINEER agree the parties agree first to try in good faith to settle the dispute by mediation with a mutually acceptable mediator before invoking Section 16.7.D.
- D. For all legal actions, initiated by the CONTRACTOR (or the CONTRACTOR's surety) against the OWNER, or by the OWNER against the CONTRACTOR (or the CONTRACTOR's surety), the Superior Court for the State of Alaska, First Judicial District at Juneau, Alaska shall be the exclusive jurisdiction for any action of any kind and any nature arising out of or related to this Agreement or the Contract Documents or arising out of or relating to the performance of this Agreement or any performance of the WORK. CONTRACTOR agrees that venue for trial in any action shall be in Skagway, Alaska. The laws of the State of Alaska shall govern the rights and obligations of the parties. The CONTRACTOR specifically waives any right or opportunity to request a change of venue for the trial pursuant to A.S. 22.10.040.
- E. If one of the questions at issue is the satisfactory performance of the work by the CONTRACTOR and should the Court or jury find the work of the CONTRACTOR to be unsatisfactory, then the CONTRACTOR (or the CONTRACTOR's surety) shall reimburse the OWNER for all legal fees and all other expenses incurred by the OWNER, including all costs, attorneys fees and expert costs and fees and, further, it is agreed that the OWNER may

deduct such expense from any sum or sums then, or any that become due the CONTRACTOR under the Contract.

16.8 CERTIFIED PAYROLLS

- A. All CONTRACTORS or subcontractors who perform work on a public construction contract for the OWNER shall file a certified payroll with the Alaska Department of Labor before Friday of each week that covers the preceding week (Section 14-2-4 ACLA 1949; am Section 4 ch 142 SLA 1972).
- B. In lieu of submitting the State payroll form, the CONTRACTOR's standard payroll form may be submitted, provided it contains the information required by AS 36.05.040 and a statement that the CONTRACTOR is complying with AS 36.10.010.
- C. A CONTRACTOR or subcontractor, who performs work on public construction in the State, as defined by AS 36.95.010(3), shall pay not less than the current prevailing rate of wages as issued by the Alaska Department of Labor before the end of the pay period. (AS 36.05.010).

16.9 PREVAILING WAGE RATES

- A. Wage rates for Laborers and Mechanics on Public Contracts, AS 36.05.070. The CONTRACTOR, or subcontractors, shall pay all employees unconditionally and not less than once a week. Wages may not be less than those stated in Paragraph 16.8C, regardless of the contractual relationship between the CONTRACTOR or subcontractors and laborers, mechanics, or field surveyors. The scale of wages to be paid shall be posted by the CONTRACTOR in a prominent, easily accessible place at the site of the work.
- B. Failure to Pay Agreed Wages, AS 36.05.080. If it is found that a laborer, mechanic, or field surveyor employed by the CONTRACTOR or subcontractor has been, or is being, paid a rate or wages less than the established rate, the OWNER may, by written notice, terminate the CONTRACTOR or subcontractors right to proceed with the work. The

OWNER may prosecute the work to completion by contract or otherwise, and the CONTRACTOR and sureties will be held liable to the OWNER for excess costs for completing the work. (Section 2 ch 52 SLA 1959).

- D. Listing CONTRACTORS Who Violate Contracts, AS 36.05.090. In addition, a list giving the names of persons who have disregarded the rights of their employees shall be distributed to all departments of State government and all political subdivisions. No person appearing on this list, and no firm, corporation, partnership or association in which the person has an interest, may work as a CONTRACTOR or subcontractor on a public construction contract for the State, or a political subdivision of the state, until three years after the date of publication of the list. (Section 3 ch 52 SLA 1959; am Section 9 ch 142 SLA).
- 16.10 EMPLOYMENT REFERENCE. Workers employed in the execution of the Contract by the CONTRACTOR or by any subcontractor under this Contract shall not be required or permitted to labor more than 8 hours a day or 40 hours per week in violation of the provisions of the Alaska Wage and Hour Act, Section 23.10.060.
- 16.11 COST REDUCTION INCENTIVE
- A. At any time within 45 days after the date of the Notice of Award, the CONTRACTOR may submit to the OWNER'S REPRESENTATIVE in writing, proposals for modifying the plans, specifications, or other requirements of this Contract for the sole purpose of reducing the total cost of construction. The cost reduction proposal shall not impair in any manner the essential functions or characteristics of the project, including but not limited to, service life, economy of operation, ease of maintenance, desired appearance or design and safety standards.
- B. The cost reduction proposal shall contain the following information:
1. Description of both the existing Contract requirements for performing the WORK and the proposed changes.
 2. An itemization of the Contract requirements that must be changed if the proposal is adopted.
 3. A detailed estimate of the time required and the cost of performing the WORK under both the existing contract and the proposed change.
 4. A statement of the date by which the CONTRACTOR must receive

- the decision from the OWNER on the cost reduction proposal.
5. The Contract items of WORK affected by the proposed changes including any quantity variations.
 6. A description and estimate of costs the OWNER may incur in implementing the proposed changes, such as test and evaluation and operating and support costs.
 7. A prediction of any effects the proposed change would have on future operations and maintenance costs to the OWNER.
- C. The provisions of this section shall not be construed to require the OWNER to consider any cost reduction proposal which may be submitted; nor will the OWNER be liable to the CONTRACTOR for failure to accept or act upon any cost reduction proposal submitted, or for delays to the work attributable to the consideration or implementation of any such proposal.
- D. If a cost reduction proposal is similar to a change in the plans or specifications for the project under consideration by the OWNER at the time the proposal is submitted, the OWNER will not accept such proposal and reserves the right to make such changes without compensation to the CONTRACTOR under the provisions of this section.
- E. The CONTRACTOR shall continue to perform the work in accordance with the requirements of the contract until an executed change order incorporating the cost reduction proposal has been issued. If any executed change order has not been issued by the date upon which the CONTRACTOR's cost reduction proposal specifies that a decision should be made by the OWNER, in writing, the cost reduction proposal shall be considered rejected.
- F. The OWNER shall be the sole judge of the acceptability of a cost reduction proposal and of the estimated net savings in contract time and construction costs resulting from the adoption of all or any part of such proposal. Should the CONTRACTOR disagree with OWNER's decision on the cost reduction proposal, there is no further consideration. The OWNER reserves the right to make final determination.
- G. If the CONTRACTOR's cost reduction proposal is accepted in whole or in part, such acceptance will be made by a Contract Change Order, which specifically states that the change is executed pursuant to this cost reduction

proposal section. Such Change Order shall incorporate the changes in the plans and specifications which are necessary to permit the cost reduction proposal or such part of it as has been accepted to be put into effect and shall include any conditions upon which the OWNER's approval is based, if such approval is conditional. The Change Order shall also describe the estimated net savings in the cost of performing the work attributable to the cost reduction proposal, and shall further provide that the Contract cost be adjusted by crediting the OWNER with the estimated net savings amount.

- H. Acceptance of the cost reduction proposal and performance of the work does not extend the time of completion of the contract, unless specifically provided in the Change Order authorizing the use of the submitted proposal. Should the adoption of the cost reduction proposal result in a contract time savings, the total contract time shall be reduced by an amount equal to the time savings realized.
- I. The amount specified to the CONTRACTOR in the Change Order accepted in the cost reduction proposal shall constitute full compensation for the performance of work. No claims for additional costs as a result of the changes specified in the cost reduction proposal shall be allowed.
- J. The OWNER reserves the right to adopt and utilize any approved cost reduction proposal for general use on any contract administered when it is determined suitable for such application. Cost reduction proposals identical, similar, or previously submitted will not be accepted for consideration if acceptance and compensation has previously been approved. The OWNER reserves the right to use all or part of any cost reduction proposal without obligation or compensation of any kind to the CONTRACTOR.
- K. The CONTRACTOR shall bear the costs, if any, to revise all bonds and insurance requirements for the Project, to include the cost reduction WORK.

END OF SECTION

SC-1 CONFLICT WITH SPECIAL CONDITIONS AND GENERAL CONDITIONS

The Special Conditions supplement the General Conditions. Where conflicts exist between the Special Conditions and the General Conditions the Special Conditions shall prevail.

SC-2 UTILITY OUTAGES, CONFLICTS

The Contractor shall be entirely responsible for any and all damage sustained by any and all parties affected by utility outages caused by them, whether the outages are deliberate or accidental. The Contractor shall make all necessary efforts to prevent damages, and shall make all necessary efforts to repair and restore facilities or equipment damages as a result of such outages in a timely manner.

SC-3 JOB SITE SECURITY

The contractor shall be responsible for security of the job site, building interior and exterior areas designated for use by the Contractor. The Owner will not provide security of any kind for the duration of the project in those areas affected by construction and shall not be liable to anyone for the lack of security.

SC-4 ON-SITE MATERIALS, STORAGE AND PROTECTION

Construction materials may be stored on site. See drawings for designated Contractor staging area. Such storage shall be protected from the weather and secured in a neat and orderly fashion. The Owner shall not be responsible for the Contractor's materials and equipment. The Contractor will be responsible for, and should include in its bid, the cost of any off-site warehousing, storage and security, as may be necessary to accomplish the Work.

SC-5 SUPERINTENDENT

The superintendent shall be responsible for coordination of the work of all sub contractors. The Superintendent must have negotiating authority for Contract Modifications. The superintendent shall be present on site at all times work is in progress. Designation of an Acting Superintendent in the absence of the Superintendent, must be approved 72 hours in advance by the Owner and architect.

SC-6 TIME

Begin Work: Upon Notice to Proceed
Substantial Completion: March 18, 2025
Final Completion: April 15, 2025

SC-7 LIQUIDATED DAMAGES

The CONTRACTOR will pay the MUNICIPALITY up to \$1,500 per day as liquidated damages if the project is not completed in accordance with the Project specifications.

END OF SECTION

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GENERAL: These Supplementary General Conditions make additions, deletions, or revisions to the General Conditions as indicated herein. All provisions which are not so added, deleted, or revised remain in full force and effect. Terms used in these Supplementary General Conditions which are defined in the General Conditions have the meanings assigned to them in the General Conditions.

SGC 2.2 COPIES OF DOCUMENTS: Contractor may request up to 2 copies of contract documents and drawings.

SGC 4.2 PHYSICAL CONDITIONS - SUBSURFACE AND EXISTING STRUCTURES:

In the preparation of the Contract Documents, the Engineer has relied upon:

- A. Previous plan sets, field measurements and visual inspection of the existing structures and surface conditions.

SGC 5.2 INSURANCE AMOUNTS: The limits of liability for the insurance required by Paragraph 5.2 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:

- A. Workers' Compensation: (under Paragraph 5.2C.1 of the General Conditions) as in accordance with AS 23.30.045:

- 1. State: Statutory
- 2. Applicable Federal (e.g., Longshore): Statutory

Note: If the WORK called for in the Contract Documents involves work in or on any navigable waters, the CONTRACTOR shall provide Workers' Compensation coverage which shall include coverage under the Longshore and Harbor Workers' Compensation Act, the Jones Act, and any other coverage required under Federal or State laws pertaining to workers in or on navigable waters.

- 3. Employers Liability

Bodily Injury by Accident:	\$500,000.00	Each Accident
Bodily Injury by Disease:	\$100,000.00	Each Employee
Bodily Injury by Disease:	\$500,000.00	Policy Limit

- a. CONTRACTOR agrees to waive all rights of subrogation against the OWNER and ENGINEER for work performed under Contract.
- b. If CONTRACTOR directly utilizes labor outside of the State of Alaska in the prosecution of the WORK, "Other States" endorsement shall be required as a condition of the Contract.

- B. Commercial General Liability: (under Paragraph 5.2C.2 of the General Conditions):

Combined Single Limit	\$2,000,000.00	Each Occurrence
	\$2,000,000.00	Annual Aggregate

- a. General Policy

	\$2,000,000.00	Each Occurrence
	\$5,000,000.00	Annual Aggregate

- b. Products/Completed Operations

	\$1,000,000.00	Each Occurrence
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- | | | | |
|----|-----------------|----------------|------------------|
| | | \$2,000,000.00 | Annual Aggregate |
| c. | Personal Injury | \$2,000,000.00 | Each Occurrence |
| d. | Environmental | \$2,000,000.00 | Each Occurrence |
- C. Commercial Automobile Liability: (under Paragraph 5.2C.3 of the General Conditions) including Owned, Hired, and Non-Owned Vehicles:
- D. Builders Risk Policy: Required. General Contractor shall purchase the builder's risk policy and list the building owner and subcontractors as additional insured.
- E. Policies shall also specify insurance provided by CONTRACTOR will be considered primary and not contributory to any other insurance available to the OWNER or the Engineer.
- F. All policies will provide for 30 days written notice prior to any cancellation or nonrenewal of insurance policies required under Contract. "Will endeavor" and "but failure to mail such notice shall impose no obligation or liability of any kind upon the Company, its agents or representatives" wording will be deleted from certificates.
- G. The Municipality of Skagway shall be named as an "Additional Insured" under all liability coverage listed in this Section, except for workers' compensation insurance, and as an additional insured on the general liability policy of all subcontractors.
- H. CONTRACTOR shall insure that every subcontractor complies in full with every provision of this section regarding Insurance. The failure of the CONTRACTOR to require compliance by the subcontractors shall be a material breach of this Contract by the CONTRACTOR.

SCG 14.3 APPLICATION FOR PROGRESS PAYMENT:

- A. The Net Payment Due the CONTRACTOR shall be the above-mentioned subtotal from which shall be deducted the total amount of all previous payments made to the CONTRACTOR. Final payment shall not be submitted until:
1. final inspection has been made;
 2. completion of the project; and
 3. acceptance of the project by the OWNER.

SGC 14.9 FINAL PAYMENT AND ACCEPTANCE: Add the following paragraph:

- A. Prior to the final payment the CONTRACTOR shall contact the Alaska Department of Labor (ADOL) and provide the OWNER with clearance from the ADOL for the CONTRACTOR and all subcontractors that have worked on the project. This clearance shall indicate that all Employment Security Taxes have been paid.

END OF SECTION

PART 1 – GENERAL

1.1 INDEX OF PERMITS

- A. Alaska Department of Public Safety, Fire and Life Safety, Plan Review and Approval. Approval to Construct has been applied for and will be issued by Addendum.
- B. Owner to provide all local permits.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

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PART 1 - GENERAL

1.1 GENERAL

- A. The WORK to be performed under this contract shall consist of furnishing all plant, tools, equipment, materials, supplies, manufactured articles and furnishing all labor, transportation, mobilization and demobilization, and services, including all fuel, power, water and essential communications and performing all WORK, or other operations required for the fulfillment of the contract in strict accordance with the Contract Documents. The WORK shall be complete, and all WORK, materials, and services, not expressly indicated or called for in the Contract Documents which may be necessary for the complete and proper construction of the WORK in good faith shall be provided by the CONTRACTOR as though originally so indicated, at no increase in cost to the OWNER.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

- A. **Base Bid:** Work includes demolition of existing restroom building, site preparation, wood framed building, exterior and interior components, concrete sidewalks and landings, utility connections, and miscellaneous related work on a site owned by the Municipality of Skagway and located at 175 Congress Way, Skagway Alaska 99840.
- B. **Site of WORK:** The project site is located in Skagway, Alaska at 175 Congress Way.

1.3 WORK BY OTHERS

- A. The CONTRACTOR's attention is directed to the fact that work may be conducted at the site by other contractors during the performance of the WORK under this contract. The CONTRACTOR shall conduct its operations so as to cause a minimum of interference with the WORK of such other contractors, and shall cooperate fully with such contractors to provide continued safe access to their respective portions of the site, as required to perform work under their respective contracts.
- B. **Interference with Work on Utilities.** The CONTRACTOR shall cooperate fully with all utility forces of the OWNER or private agencies engaged in the relocation, altering, or otherwise rearranging of any facilities which interfere with the progress of the WORK, and shall schedule the WORK so as to minimize interference with said relocation, altering, or other rearranging of facilities.

1.4 CONTRACTOR USE OF PROJECT SITE

- A. The CONTRACTOR's use of the Project site shall include construction operations and storage of materials, fabrication facilities, and field offices only in those areas identified on the Drawings.

1.5 OWNER USE OF THE PROJECT SITE

- A. The OWNER may utilize all or part of the existing site during the entire period of construction for the conduct of the OWNER's normal operations. The CONTRACTOR shall cooperate and coordinate with the ENGINEER to facilitate the OWNER's operations and to minimize interference with the CONTRACTOR's operation at the same time. In any event, the OWNER shall be allowed access to the Project site during the period of construction.

1.6 PROJECT MEETINGS

A. Pre-Construction Conference

- 1. Prior to the commencement of WORK at the site, a Pre-Construction Conference will be held at a mutually agreed time and place which shall be attended by the CONTRACTOR's Project Manager, its superintendent, and its Subcontractors as the CONTRACTOR deems appropriate. Other attendants will be:
 - a. ENGINEER and Inspector.
 - b. Representatives of OWNER.
 - c. Governmental representatives as appropriate.
 - d. Others as requested by CONTRACTOR, OWNER, or ENGINEER.
- 2. Unless previously submitted to the ENGINEER, the CONTRACTOR shall bring to the Pre-Construction Conference one copy each of the following:
 - a. Plan of Operation.
 - b. Project Overview Bar Chart Schedule.
 - c. Procurement schedule of major equipment and materials and items requiring long lead time.
 - d. Shop Drawing/Sample/Substitute or "Or Equal" submittal schedule.
 - e. Name and telephone number of CONTRACTOR's Project Supervisor.
 - f. Erosion Control Plan with Storm Water Pollution Prevention Plan.
 - g. Traffic Control Plan and DOT&PF Right-of-Way permit application.
- 3. The purpose of the Pre-Construction Conference is to designate responsible personnel and establish a working relationship. Matters requiring coordination will be discussed and procedure for handling such matters established. The complete agenda will be furnished to the CONTRACTOR prior to the meeting date. The CONTRACTOR should be prepared to discuss all of the items listed below:

- a. Status of CONTRACTOR's insurance and bonds.
 - b. CONTRACTOR's tentative construction schedules.
 - c. Transmittal, review, and distribution of CONTRACTOR's submittals.
 - d. Processing applications for payment.
 - e. Maintaining record documents.
 - f. Critical WORK sequencing and long lead items.
 - g. Field decisions and Change Orders.
 - h. Use of Project site, office and storage areas, security, housekeeping, and OWNER's needs.
 - i. Major equipment deliveries and priorities.
 - j. CONTRACTOR's assignments for safety and first aid.
4. The ENGINEER will preside at the Pre-Construction Conference and will arrange for keeping and distributing the minutes to all persons in attendance.
 5. The CONTRACTOR and its Subcontractors should plan on the conference taking no longer than three hours. Items listed in paragraph 3 will be covered as well as a review of the Drawings and Specifications with the ENGINEER and OWNER.
- B. Progress Meetings
1. The CONTRACTOR shall schedule and hold regular on-site progress meetings at least weekly and at other times as requested by the ENGINEER, or as required by the progress of the WORK. The CONTRACTOR, ENGINEER, and all Subcontractors active on the site must attend each meeting. CONTRACTOR may at its discretion request attendance by representatives of its Suppliers, manufacturers, and other Subcontractors.
 2. The ENGINEER shall conduct the meeting and will arrange for recording and distributing the minutes. The purpose of the meetings will be to review the progress of the WORK, maintain coordination of efforts, discuss changes in scheduling, and resolve other problems which may develop. During each meeting, the CONTRACTOR is required to present any issues which may impact the WORK, with a view toward resolving these issues expeditiously.

1.7 DEFINITIONS APPLICABLE TO TECHNICAL SPECIFICATIONS

- A. The following words have the meaning defined in the Technical Portions of the WORK:
1. **Furnish** - means to supply and deliver to the site, to unload and unpack ready for assembly, installation, testing, and start-up.

2. **Indicated** - is a word used to direct the CONTRACTOR to information contained on the drawings or in the Specifications. Terms such as “shown”, “noted”, “scheduled”, and “specified” also may be used to assist in locating information but no limitation of location is implied or intended.
3. **Install** - defines operations at the site including assembly, erection, placing, anchoring, applying, shaping to dimension, finishing, curing, protecting, and cleaning, ready for the OWNER’s use.
4. **Installer** - a person or firm engaged by the CONTRACTOR or its subcontract, or any Subcontractor, for the performance of installation, erection, or application WORK at the site. Installers must be expert in the operations they are engaged to perform.
5. **Provide** - is defined as furnish and install, ready for the intended use.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

PART 1 - GENERAL

1.1 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with the line items of the Bid Schedule and preparation of Contractor's construction schedule. See 000310 – Bid Schedule for inclusion of items in the Schedule of Values.
 - 1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with continuation sheets.
 - b. Submittal schedule.
 - c. Items required to be indicated as separate activities in Contractor's construction schedule.
 - 2. Submit the schedule of values to Engineer earliest possible date, but no later than 28 days after date established for the Notice to Proceed.

- 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. Name of Project Engineer.
 - c. Owner's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 - 2. 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.
 - 1) Labor.
 - 2) Materials.
 - 3) Equipment.
 - 3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents.
 - 4. Round amounts to nearest whole dollar; total shall equal 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. If required, include evidence of insurance.
 - 6. Provide a separate single line item in the schedule of values that includes
 - a. Close-Out requirements of all disciplines,
 - b. Final cleanup and site restoration,
 - c. Demobilization of all disciplines.
 - 7. Each item in the schedule of values and Applications for Payment shall be

complete. Include total cost and proportionate share of general overhead and profit for each item.

- a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.
8. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.2 SCOPE

- A. Payment for the various items of the Bid Schedule, as further specified herein, shall include all compensation to be received by the CONTRACTOR for furnishing all tools, equipment, supplies, and manufactured articles, and for all labor, operations, mobilization and demobilization, and incidentals appurtenant to the items for WORK being described, as necessary to complete the various items of the WORK all in accordance with the requirements of the Contract Documents, and including all costs of permits and cost of compliance with the regulations of public agencies having jurisdiction, including but not limited to, Safety and Health Requirements of Occupational Safety and Health Administration of the U.S. Department of Labor (OSHA) and Occupational Safety and Health Standards of the Alaska Department of Labor, Division of Labor Standards and Safety.
- B. No separate payment will be made for any Pay Item that is not specifically set forth in the Bid Schedule, and all costs therefore shall be included in the prices named in the Bid Schedule for the various items of WORK.
- C. In addition to the other incidental items of WORK listed elsewhere in the contract, the following items shall also be considered as incidental to other items of WORK under this contract:
 1. Maintenance of all services through the Project area including power, communications, water, storm sewers, sanitary sewers, garbage pickup, mail delivery and emergency vehicles.
 2. Repair or replacement of existing adjacent facilities including piping, landscaping, steel, timber, concrete and asphalt items, if damaged by the CONTRACTOR.
 3. Final clean-up and site restoration.
 4. All WORK necessary for coordination of work to be accomplished by private utility companies and property owners within the Project limits.
 5. Removal and replacement of survey monuments and markers disturbed during construction, whether shown on the Drawings or not.
 6. All fittings required for water and sanitary sewer pipes.
 7. Watering of the Project work area as necessary for dust control.
 8. Provision and installation of all processing equipment including the relocation of the solid waste baler from the Compost Building.
 9. Restoration and grading of all disturbed areas as necessary to provide a smooth transition to existing surfaces.

END OF SECTION

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PART 1 - GENERAL

1.1 GENERAL

- A. Titles of Sections and Paragraphs. Captions accompanying Specification sections and paragraphs are for convenience of reference only and do not form a part of the Specifications.
- B. Applicable Publications. Whenever in these Specifications references are made to published specifications, codes or other requirements, it shall be understood that wherever no date is specified, only the latest specifications, standards, or requirements of the respective issuing agencies which have been published as of the date that the WORK is advertised for bids, shall apply; except to the extent that the standards or requirements may be in conflict with applicable laws, ordinances, or governing codes. No requirements set forth herein or shown on the Drawings shall be waived because of any provision of, or omission from, the standards or requirements.
- C. Specialists, Assignments. In certain instances, Specification text requires (or implies) that specific WORK is to be assigned to specialists or expert entities who must be engaged for the performance of that WORK. Such assignments shall be recognized as special requirements over which the CONTRACTOR has no choice or option. These requirements shall not be interpreted so as to conflict with the enforcement of building codes and similar regulations governing the WORK; also they are not intended to interfere with local union jurisdiction settlements and similar conventions. Such assignments are intended to establish which party or entity involved in a specific unit of WORK is recognized as "expert" for the indicated construction processes or operations. Nevertheless, the final responsibility for fulfillment of the entire set of contract requirements remains with the CONTRACTOR.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Without limiting the generality of other requirements of the Specifications, all WORK specified herein shall conform to or exceed the requirements of applicable codes and the applicable requirements of the following documents:
 - 1. References herein to "Building Code" or "Uniform Building Code" shall mean Uniform Building Code of the International Conference of Building Officials (ICBO).
 - 2. Similarly, references to "Mechanical Code" or "Uniform Mechanical Code," "Plumbing Code" or "Uniform Plumbing Code," "Fire Code" or "Uniform Fire Code," shall mean Uniform Mechanical Code, Uniform Plumbing Code and Uniform Fire Code of the International Conference of the Building Officials (ICBO). "Electric Code" or "National Electric Code (NEC)" shall mean the National Electric Code of the National Fire Protection Association (NFPA). The latest edition of the codes as approved by the Municipal code and used by the local agency as of the date that the WORK is advertised for bids, as adopted by the agency having jurisdiction, shall apply to the WORK herein, including all Addenda, modifications, amendments, or other lawful changes thereto.

3. In case of conflict between codes, reference standards, Drawings and other Contract Documents, the most stringent requirements shall govern. All conflicts shall be brought to the attention of the ENGINEER for clarification and directions prior to ordering or providing any materials or furnishing labor. The CONTRACTOR shall bid for the most stringent requirements.

- B. The CONTRACTOR shall construct the WORK specified herein in accordance with the requirements of the Contract Documents and the referenced portions of those referenced codes, standards, and Specifications listed herein.

- C. References herein to "OSHA Regulations for Construction" shall mean Title 29, Part 1926, Construction Safety and Health Regulations, Code of Federal Regulations (OSHA), including all changes and amendments thereto.

- D. References herein to "OSHA Standards" shall mean Title 29, Part 1910, Occupational Safety and Health Standards, Code of Federal Regulations (OSHA), including all changes and amendments thereto.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

PART 1 – GENERAL

1.1 GENERAL

- A. Wherever submittals are required hereunder, all such submittals shall be submitted to the ENGINEER by the CONTRACTOR.
- B. Within 7-days after the date of commencement as stated in the Notice To Proceed, the CONTRACTOR shall submit the following items to the ENGINEER for review:
 - 1. A preliminary schedule of Shop Drawings, sample, and proposed substitutes or “or-equal” submittals.
 - 2. A list of all permits and licenses the CONTRACTOR shall obtain indicating the agency required to grant the permit and the expected date of submittal for the permit and required date for receipt of the permit.
 - 3. A complete progress schedule for all phases of the Project.
 - 4. Material Safety Data Sheets on products used on the Project.
 - 5. A traffic maintenance plan, as required.
 - 6. A letter designating the CONTRACTOR’s Superintendent, defining that person’s responsibility and authority. Include a resume and minimum of three similar project references showing supervision of crew and sub-contractors for the proposed Superintendent.
 - 7. A letter designating the CONTRACTOR’s safety representative and the Equal Employment Opportunity (EEO) Officer and that person’s responsibility and authority.
- C. Within 7 days after date of commencement as stated in the Notice To Proceed, the CONTRACTOR shall submit a Schedule of Values detailing related specification sections or Division, all sub-contractors and their breakdown of divisions, and tabulated with separate labor, materials, and equipment breakdowns. See Section 001025 Measurement and Payment.
- D. No payments shall be made to the CONTRACTOR until all of these items are submitted in their entirety, as determined by the ENGINEER.
- E. Major Submittals or Long Lead Items: Major submittals and long lead items are to be submitted within 7 days of Notice to Proceed.

1.2 SHOP DRAWING SUBMITTAL

- A. Wherever called for in the Contract Documents, or where required by the ENGINEER, the CONTRACTOR shall furnish to the ENGINEER, for review, in electronic format (pdf), Shop Drawings The term “Shop Drawings” as used herein shall be understood to include detail design calculations, Shop Drawings, fabrication drawings, installation drawings, erection drawings, lists, graphs, operating instructions, catalog sheets, data sheets, American Iron and Steel (AIS) certifications and similar items.
- B. All Shop Drawing submittals shall be accompanied by the CONTRACTOR’s standard submittal transmittal form. Any submittal not accompanied by such a form, or where all applicable items on the form are not completed, will be returned for re-submittal.
- C. Normally, a separate transmittal form shall be used for each specific item or class of material or equipment for which a submittal is required. Transmittal of a submittal of

various items using a single transmittal form will be permitted only when the items taken together constitute a manufacturer's "package" or are so functionally related that expediency indicates review of the group or package as a whole. A multiple-page submittal shall be collated into sets, and each set shall be stapled or bound, as appropriate, prior to transmittal to the ENGINEER.

- D. Except as may otherwise be provided herein, the ENGINEER will return electronically each submittal to the CONTRACTOR with its comments noted thereon, within 7 calendar days following receipt of them by the ENGINEER. It is considered reasonable that the CONTRACTOR shall make a complete and acceptable submittal to the ENGINEER by the second submission of a submittal item. The OWNER reserves the right to withhold monies due to the CONTRACTOR to cover additional costs of the ENGINEER'S review beyond the second submittal.
- E. If the submittal is returned to the CONTRACTOR marked "NO EXCEPTIONS TAKEN," formal revision and resubmission of said submittal will not be required.
- F. If the submittal is returned to the CONTRACTOR marked "MAKE CORRECTIONS NOTED," formal revision and resubmission of said submittal is not required.
- G. If the submittal is returned to the CONTRACTOR marked "REVISE RESUBMIT," the CONTRACTOR shall revise said submittal and shall resubmit the revised submittal to the ENGINEER.
- H. If the submittal is returned to the CONTRACTOR marked "REJECTED RESUBMIT," the CONTRACTOR shall revise said submittal and shall resubmit the revised submittal to the ENGINEER.
- I. Fabrication of an item may be commenced only after the ENGINEER has reviewed the pertinent submittal and returned copies to the CONTRACTOR marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED." Corrections indicated on submittals shall be considered as changes necessary to meet the requirements of the Contract Documents and shall not be taken as the basis for changes to the Contract requirements only a Change Order can alter the Contract Price, Contract Time, or Specifications.
- J. All CONTRACTOR Shop Drawing submittals shall be carefully reviewed by an authorized representative of the CONTRACTOR, prior to submission to the ENGINEER. Each submittal shall be dated, signed, and certified by the CONTRACTOR, as being correct and in strict conformance with the Contract Documents. In the case of Shop Drawings, each sheet shall be dated, signed, and certified. No consideration for review by the ENGINEER of any CONTRACTOR submittal will be made for any items which have not been so certified by the CONTRACTOR. All non-certified submittals will be returned to the CONTRACTOR without action taken by the ENGINEER, and any delays caused by thereby shall be the total responsibility of the CONTRACTOR.
- K. The ENGINEER'S review of CONTRACTOR Shop Drawing submittals shall not relieve the CONTRACTOR of the entire responsibility for the correctness of details and dimensions. The CONTRACTOR shall assume all responsibility and risk for any misfits due to any errors in CONTRACTOR submittals. The CONTRACTOR shall be responsible for the dimensions and the design of adequate connections and details.

1.3 OPERATING AND MAINTENANCE MANUALS

- A. Operating and Maintenance Data:
1. Provide two sets of each type of instruction bound together in D-ring metal-ringed hardcover binders with removable pages, with a typewritten index indicating location of items in the work. Information not pertinent to this work shall be deleted or neatly and completely lined out. Binders shall be of capacity to allow a minimum of 20 percent expansion.
 2. Provide an electronic copy of the O&M manual with each spec division and spec section bookmarked for easy access.
 3. Submit required certification, warranties and testing reports.
 4. Operating and maintenance data shall be provided for Owner's Representative approval at least 30 days prior to Substantial Completion. If approved operation and maintenance instructions are not on hand at the time of Substantial Completion and/or occupancy, the Contractor, at his own expense, shall make repairs, replacements, and installation of components that may be destroyed or damaged due to the absence of specified instructions, and shall hold the Owner harmless.
 5. See specific discipline specification section for O&M requirements.

1.4 RECORD DRAWINGS SUBMITTALS

- A. The CONTRACTOR shall keep and maintain, at the job site, one record set of Drawings. On these, it shall mark all project conditions, locations, configurations, and any other changes or deviations which may vary from the details represented on the original Contract Drawings, including buried or concealed construction and utility features which are revealed during the course of construction in red ink. Special attention shall be given to recording the horizontal and vertical location of all buried utilities that differ from the locations indicated, or which were not indicated on the Contract Drawings. The record drawings shall be supplemented by any detailed sketches as necessary or directed to indicate, fully, the WORK as actually constructed. These master record Drawings, of the CONTRACTOR's representation of as-built conditions, including all revisions made necessary by Addenda, Change Orders, and the like shall be maintained up-to-date during the progress of the WORK.
- B. In the case of those Drawings which depict the detail requirement for equipment to be assembled and wired in the factory, such as motor control centers and the like, the record drawings shall be updated by indicating those portions which are superseded by Change Order Drawings or final Shop Drawings, and by including appropriate reference information describing the Change Orders by number and the Shop Drawings by manufacturer, Drawing, and revision numbers.
- C. Record drawings shall be accessible to the ENGINEER AND OWNER at all times

during the construction period and shall be delivered to the ENGINEER on the 20th working day of every month after the month in which the Notice to Proceed is given as well as upon final completion of the WORK.

- D. Final payment will not be acted upon until the CONTRACTOR-prepared Record Drawings have been delivered to the ENGINEER.

1.5 PROGRESS SCHEDULES

- A. The progress schedule shall be submitted monthly electronically through the duration of the Project to the ENGINEER in Bar Chart or Critical Path Method (CPM) form as required by the ENGINEER.
- B. The progress schedule shall show the order in which the CONTRACTOR proposes to carry out the work and the contemplated date on which the CONTRACTOR and their subcontractors will start and finish each work task of the work, including any scheduled periods of shutdown. The schedule shall also indicate any anticipated periods of multiple-shift WORK.
- C. Upon substantial changes to the CONTRACTOR's progress schedule of work or upon request of the ENGINEER, the CONTRACTOR shall submit a revised progress schedule(s) in the form required. Such revised schedule(s) shall conform with the contract time and take into account delays which may have been encountered in the performance of the WORK. In submitting a revised schedule, the CONTRACTOR shall state specifically the reason for the revision and the adjustments made in his schedule or methods of operation to ensure the completion of all the WORK within the contract time.

1.6 PROPOSED SUBSTITUTES OR "OR-EQUAL" ITEM SUBMITTAL

- A. Whenever materials or equipment are specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular supplier, the naming of the item is intended to establish the type, function, and equality required. If the name is followed by the words "or-equal" indicating that a substitution is permitted, materials or equipment of other suppliers may be accepted by the ENGINEER, if sufficient information is submitted by the CONTRACTOR to allow the ENGINEER to determine that the material or equipment proposed is equivalent or equal to that named, subject to the following requirements:
 1. The burden of establishing the proposed substitute material or equipment as to the type, function, and quality of any such substitute material or equipment shall be upon the CONTRACTOR.
 2. The ENGINEER will determine as to the type, function, and quality of any proposed substitute material or equipment and the ENGINEER'S decision shall be final.
 3. The ENGINEER may require the CONTRACTOR, to furnish at the CONTRACTOR's expense, additional data about the proposed substitute.
 4. The OWNER may require the CONTRACTOR to furnish at the CONTRACTOR's expense a special performance guarantee or other surety with respect to any substitute.
 5. Acceptance by the ENGINEER of a substitute item proposed by the CONTRACTOR shall not relieve the CONTRACTOR of the responsibility for full

- compliance with the Contract Documents and for adequacy of the substitute item.
6. The CONTRACTOR shall be responsible for resultant changes and all additional costs which the accepted substitution requires in the CONTRACTOR's WORK, the WORK of its Subcontractors and of other contractors, and shall effect such changes without cost to the OWNER. This shall include the cost for redesign and claims of other Contractor affected by the resulting change.
- B. The procedure for review by the ENGINEER will include the following:
1. If the CONTRACTOR proposes to furnish or use a substitute an item of material or equipment, the CONTRACTOR shall make written application to the ENGINEER on the "Substitution Request Form" for acceptance thereof.
 2. Unless otherwise authorized in writing by the ENGINEER, the "Substitution Request Form(s)" shall be submitted within the 7-day period after Notice To Proceed.
 3. Wherever a proposed substitute material or equipment has not been submitted within said 7-day period, or wherever the submission of a proposed substitute material or equipment has been determined to be unacceptable by the ENGINEER, the CONTRACTOR shall provide the material or equipment named in the Contract Documents.
 4. The CONTRACTOR shall certify that the proposed substitute will perform adequately the functions and achieve the results called for by the general design, be similar and of equal substance to that specified, and be suited to the same use as that specified.
 5. The ENGINEER will be allowed a reasonable time within which to evaluate each proposed substitute. In no case will this reasonable time period be less than 7 days.
 6. As applicable, no Shop Drawing submittals will be made for a substitute item nor will any substitute item be ordered, installed, or utilized without the ENGINEER's prior written acceptance of the CONTRACTOR's "Substitution Request Form" which will be evidenced by a Change Order.
 7. The ENGINEER will record the time required by the ENGINEER in evaluating substitutions proposed by the CONTRACTOR and in making changes in the Contract Documents occasioned thereby. Whether or not the ENGINEER accepts a proposed substitute, the CONTRACTOR shall reimburse the OWNER for the charges of the ENGINEER for evaluating each proposed substitute.
- C. The CONTRACTOR's application using the "Substitution Request Forms" shall contain the following statements and/or information which shall be considered by the ENGINEER in evaluating the proposed substitution:
1. The evaluation and acceptance of the proposed substitute will not prejudice the CONTRACTOR's achievement of Substantial Completion on time.
 2. Whether acceptance of the substitute for use in the WORK will require a change in any of the Contract Documents to adopt the design to the proposed substitute.
 3. Whether incorporation or use of the substitute in connection with the WORK is subject to payment of any license fee or royalty.
 4. All variations of the proposed substitute for that specified will be identified.
 5. Available maintenance, repair, and replacement service and its estimated cost will be indicated.
 6. Itemized estimate of all costs that will result directly or indirectly from acceptance of such substitute, including cost of redesign and claims of other contractors affected by the resulting change.

1.7 MATERIAL CERTIFICATION SUBMITTAL

- A. The ENGINEER may permit the use, prior to sampling, inspection and testing, of certain materials or assemblies when accompanied by manufacturer's material certifications stating that such materials or assemblies fully comply with the requirements of the Contract. The certification shall be signed by the manufacturer, and will specifically reference the material's compliance with the AASHTO, ASTM and/or Standards specified in the applicable Contract Documents.
- B. Material certifications shall be submitted to the ENGINEER prior to incorporating the item into the WORK.
- C. Materials or assemblies used on the basis of material certifications may be sampled, inspected and/or tested at any time, and if found not in conformity with these specifications, will be subject to rejection whether in place or not.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

(SUBSTITUTION REQUEST FORM - next page)

Municipality of Skagway
SUBSTITUTION REQUEST FORM

TO: Project: SOLID WASTE TRANSFER FACILITY

OWNER: MUNICIPALITY OF SKAGWAY

SPECIFIED ITEM:

Section	Page	Paragraph	Description
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The undersigned requests consideration of the following:

PROPOSED SUBSTITUTION: _____

Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of the request. Applicable portions of the data are clearly identified.

The undersigned states that the following paragraphs, unless modified on attachments are correct:

1. The proposed substitution does not affect dimensions shown on Drawings and will not require a change in any of the Contract Documents.
2. The undersigned will pay for changes to the design, including engineering design, detailing, and Construction costs caused by the requested substitution which is estimated to be \$_____.
3. The proposed substitution will have no adverse affect on other contractors, the construction schedule (specifically the date of substantial completion), or specified warranty requirements.
4. Maintenance and service parts will be locally available for the proposed substitution.
5. The incorporation or use of the substitute in connection with the WORK is not subject to payment of any license fee or royalty.

The undersigned further states that the function, appearance, and quality of the Proposed Substitution are equivalent or superior to the Specified item.

Submitted by CONTRACTOR: _____ Reviewed by ENGINEER _____

Signature _____ Accepted Accepted as Noted

Firm: _____ Not Accepted Received Too Late

By: _____ Date:

Title: _____ Telephone:

Date: _____

Attachments:

END OF SECTION

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PART 1 - GENERAL

1.1 DEFINITION

- A. Specific quality control requirements for the WORK are indicated throughout the Contract Documents. The requirements of this section are related to performance of the WORK beyond furnishing of manufactured products. The term "Quality Control" includes inspection, sampling and testing, and associated requirements.

1.2 INSPECTION AT PLACE OF MANUFACTURE

- A. Unless otherwise indicated, all products, materials, and equipment shall be subject to inspection by the ENGINEER at the place of manufacture.
- B. The presence of the ENGINEER at the place of manufacturer, however, shall not relieve the CONTRACTOR of the responsibility for furnishing products, materials, and equipment which comply with all requirements of the Contract Documents. Compliance is the duty of the CONTRACTOR, and that duty shall not be avoided by any act or omission on the part of the ENGINEER.

1.3 SAMPLING AND TESTING

- A. Unless otherwise indicated, all sampling and testing shall be in accordance with the methods prescribed in the current standards of the ASTM, ATM, and AASHTO as applicable to the class and nature of the article or material considered and the site conditions of the WORK; however, the OWNER reserves the right to use any generally-accepted system of sampling and testing which, in the opinion of the ENGINEER will insure the OWNER that the quality of the WORK is in full accord with the Contract Documents.
- B. Any waiver by the OWNER of any specific testing or other quality assurance measures, whether or not such waiver is accompanied by a guarantee of substantial performance as a relief from the specified testing or other quality assurance requirements as originally specified, and whether or not such guarantee is accompanied by a performance bond to assure execution of any necessary corrective or remedial WORK, shall not be construed as a waiver of any requirements of the Contract Documents. Any waiver by the OWNER pursuant to this section shall be in writing and the CONTRACTOR shall not rely on or act on any verbal waiver by the OWNER, or any employees or representatives of the OWNER.
- C. Notwithstanding the existence of such waiver, the ENGINEER, with OWNER's approval, reserves the right to make independent investigations and tests, and failure of any portion of the WORK to meet any of the requirements of the Contract Documents, shall be reasonable cause for the ENGINEER to require the removal or correction and reconstruction of any such WORK in accordance with the General Conditions.

1.4 INSPECTION AND TESTING LABORATORY SERVICE

- A. Inspection and testing laboratory service shall comply with the following:
 - 1. OWNER will appoint, employ, and pay for services of an independent firm to perform inspection and testing or will perform inspection and testing itself.
 - 2. The ENGINEER will perform inspections as specified in individual Specification

- sections.
3. Reports will be submitted by the independent firm to the ENGINEER in duplicate, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.
 4. The CONTRACTOR shall cooperate with the ENGINEER or independent firm and furnish samples of materials, design mix, equipment, tools, storage and assistance as requested.
 5. The CONTRACTOR shall notify the ENGINEER 24 hours before the expected time for operations requiring inspection and laboratory testing services.
 6. Retesting required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions by the ENGINEER. The CONTRACTOR shall bear all costs from such retesting at no additional cost to the OWNER.
 7. For samples and tests required for CONTRACTOR's use, the CONTRACTOR shall make arrangements with an independent firm for payment and scheduling of testing. The cost of sampling and testing for the CONTRACTOR's use shall be included in the Contract Price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Inspection. The CONTRACTOR shall inspect materials or equipment upon the arrival on the job site and immediately prior to installation, and reject damaged and defective items.
- B. Measurements. The CONTRACTOR shall verify measurements and dimensions of the WORK, as an integral step of starting each installation.
- C. Manufacturer's Instructions. Where installations include manufactured products, the CONTRACTOR shall comply with manufacturer's applicable instructions and recommendations for installation, to whatever extent these are more explicit or more stringent than applicable requirements indicated in the Contract Documents.

END OF SECTION

PART 1 – GENERAL

1.1 GENERAL

- A. Mobilization shall include obtaining all permits; moving all plant and equipment onto and off the site; furnishing and erecting plants, temporary buildings, and other construction facilities; implementing security requirements, demobilizing all plant and equipment from the site, all as required for the proper performance and completion of the WORK. Mobilization shall include the following principal items:
1. Moving all the CONTRACTOR's plant and equipment required for operations onto the site. Demobilizing plant and equipment at closeout of the project.
 2. Providing all on-site communication facilities, including radios and cellular phones.
 3. Providing on-site sanitary facilities.
 4. Obtaining all required permits.
 5. Having all OSHA-required notices and establishment of safety programs.
 6. Having the CONTRACTOR's superintendent at the jobsite full time.
 7. Submitting initial submittals.
- B. Bid Schedule Mobilization line item for shall include the Contractors cost for all items listed above. See Section 000310 Bid Schedule.

1.2 PAYMENT FOR MOBILIZATION

- A. The CONTRACTOR's attention is directed to the condition that no payment for Mobilization, or any part thereof, will be approved for payment under the Contract Documents until all Mobilization items listed above have been completed as specified.
- B. Within 7 days after receipt of Notice to Proceed, the CONTRACTOR shall submit a breakdown showing the estimated value of each major component of Mobilization to the ENGINEER for approval. When approved by the ENGINEER, the breakdown will be the basis for initial progress payments in which Mobilization is included.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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PART 1 - GENERAL

1.1 GENERAL

- A. The CONTRACTOR shall protect all existing utilities and improvements not designated for removal and shall restore damaged or temporarily relocated utilities and improvements to a condition equal to or better than they were prior to such damage or temporary relocation, all in accordance with the requirements of the Contract Documents.
- B. The CONTRACTOR shall verify the exact locations and depths of all utilities and the CONTRACTOR shall make exploratory excavations of all utilities that may interfere with the WORK. All such exploratory excavations shall be performed as soon as practicable after award of the contract and, in any event, a sufficient time in advance of construction to avoid possible delays to the CONTRACTOR's WORK. Any utility or service in conflict with the WORK will be reburied by the CONTRACTOR prior beginning the WORK to avoid damage.
- C. The number of exploratory excavations required shall be that number which is sufficient to determine the alignment and grade of the utility. The number of exploratory excavations shall be determined by the ENGINEER.
- D. The ENGINEER shall be notified of the CONTRACTOR's field-locate schedule.

1.2 RIGHTS-OF-WAY

- A. The CONTRACTOR shall not do any WORK that would affect any oil, gas, sewer, or water pipeline; any telephone, cable television, telegraph, or electric transmission line; any fence; or any other structure, nor shall the CONTRACTOR enter upon the rights-of-way involved until notified by the ENGINEER that the OWNER has secured authority therefor from the proper party. After authority has been obtained, the CONTRACTOR, shall give the party due notice of its intention to begin WORK, if required by the party, and shall remove, shore, support to otherwise protect such pipeline, transmission line, ditch, fence, or structure or replace the same. When two (2) or more contracts are being executed at one time on the same or adjacent land in such manner that work on one contract may interfere with that on another, the OWNER shall determine the sequence and order of the WORK. When the territory of one contract is the necessary or convenient means of access for the execution of another contract, such privilege of access or any other reasonable privilege may be granted by the OWNER to the CONTRACTOR so desiring, to the extent, amount, in the manner, and at the times permitted.
- B. No such decision as to the method or time of conducting the WORK or the use of territory shall be made the basis of any claim for delay or damage, except as provided for temporary suspension of the WORK as agreed to by the ENGINEER.

1.3 PROTECTION OF SURVEY MONUMENTS, STREET AND/OR ROADWAY MARKERS

- A. The CONTRACTOR shall not destroy, remove, or otherwise disturb any existing survey monuments or other existing street or roadway markers without proper authorization. No pavement breaking or excavation shall be started until all survey or other permanent

marker points that will be disturbed by the construction operations have been properly referenced. All survey monuments, markers or points disturbed by the CONTRACTOR shall be accurately re-established, at the CONTRACTOR's expense unless provided for elsewhere in the Contract Documents, after all street or roadway resurfacing has been completed. Re-establishment of all survey monuments shall be by a Registered Alaskan Land Surveyor.

1.4 RESTORATION OF PAVEMENT

- A. General. All asphalt pavement or concrete surfaces areas, cut or damaged during construction shall be replaced with similar materials and of equal thickness to match the existing adjacent undisturbed areas, except where specific resurfacing requirements have been called for in the Contract Documents or in the requirements of the agency issuing the permit. All temporary and permanent pavement shall conform to the requirements of the affected pavement owner. All pavement which is subject to partial removal shall be neatly saw cut in straight lines.
- B. Temporary Resurfacing. Wherever required by the public authorities having jurisdiction, the CONTRACTOR shall place temporary surfacing promptly after backfilling and shall maintain such surfacing for the period of time fixed by those authorities before proceeding with the final restoration of improvements.
- C. Permanent Resurfacing. In order to obtain a satisfactory junction with adjacent surfaces, the CONTRACTOR shall saw cut and trim the edge so as to provide a clean, sound, vertical joint before permanent replacement of an excavated or damaged portion of pavement. Damaged edges of pavement along excavations and elsewhere shall be trimmed back by saw cutting in straight lines. All pavement restoration and other facilities restoration shall be constructed to finish grades compatible with adjacent undisturbed pavement.
- D. Restoration of Concrete Sidewalks or Private Driveways. Wherever concrete sidewalks or private roads have been removed for purposes of construction, the CONTRACTOR shall place suitable temporary sidewalks or roadways promptly after backfilling and shall maintain them in satisfactory condition for the period of time fixed by the authorities having jurisdiction over the affected portions before proceeding with the final restoration or, if no such period of times is so fixed, the CONTRACTOR shall maintain the temporary sidewalks or roadways until the final restoration has been made.

1.5 EXISTING UTILITIES AND IMPROVEMENTS

- A. General. The CONTRACTOR shall protect all underground utilities and other improvements which may be impaired during construction operations. It shall be the CONTRACTOR's responsibility to ascertain the actual location of all existing utilities and other improvements that will be encountered in its construction operations, and to see that such utilities or other improvements are adequately protected from damage due to such operations. The CONTRACTOR shall take all possible precautions for the

protection of unforeseen utility lines to provide for interrupted service and to provide such special protection as may be necessary.

- B. Utilities to be Moved. In case it shall be necessary to move the property of any public utility or franchise holder, such utility company or franchise holder will, upon request of the CONTRACTOR, be notified by the OWNER to move such property within a specified reasonable time. When utility lines that are to be removed are encountered within the area of operations, the CONTRACTOR shall notify the ENGINEER a sufficient time in advance for the necessary measures to be taken to prevent interruption of service.
- C. Where the proper completion of the WORK requires the temporary or permanent removal and/or relocation of an existing utility or other improvement which is indicated, the CONTRACTOR shall remove and, without unnecessary delay, temporarily replace or relocate such utility or improvement in a manner satisfactory to the ENGINEER and the owner of the facility. In all cases of such temporary removal or relocation, restoration to former location shall be accomplished by the CONTRACTOR in a manner that will restore or replace the utility or improvement as nearly as possible to its former locations and to as good or better condition than found prior to removal.
- D. OWNER's Right of Access. The right is reserved to the OWNER and to the owners of public utilities and franchises to enter at any time upon any public street, alley, right-of-way, or easement for the purpose of making changes in their property made necessary by the WORK of this contract.
- E. Underground Utilities Indicated. Existing utility lines that are indicated or the locations of which are made known to the CONTRACTOR prior to excavation and that are to be retained, and all utility lines that are constructed during excavation operations shall be protected from damage during excavation and backfilling and, if damaged, shall be immediately repaired or replaced by the CONTRACTOR.
- F. Underground Utilities Not Indicated. In the event that the CONTRACTOR damages any existing utility lines that are not indicated or the locations of which are not made know to the CONTRACTOR prior to excavation, a written report thereof shall be made immediately to the ENGINEER. If directed by the ENGINEER, repairs shall be made by the CONTRACTOR under the provisions for changes and extra WORK as agreed to by the ENGINEER.
- G. All costs of locating, repairing damage not due to failure of the CONTRACTOR to exercise reasonable care, and removing or relocating such utility facilities not shown in the Contract Documents with reasonable accuracy, and for equipment on the Project which was actually working on the portion of the WORK which was interrupted or idled by removal or relocation of such utility facilities, and which was necessarily idled during such WORK will be paid for as extra WORK as agreed to by the ENGINEER. The ENGINEER shall determine whether the CONTRACTOR exercised reasonable care.
- H. Approval of Repairs. All repairs to a damaged utility or improvement are subject to inspection and approval by an authorized representative of the utility or improvement owner before being concealed by backfill or other WORK.

- I. Maintaining in Service. All oil and gasoline pipelines, power, and telephone, cable television or the communication cable ducts, gas and water mains, irrigation lines, sewer lines, storm drain lines, poles, and overhead power and communication wires and cables encountered along the line of the WORK shall remain continuously in service during all the operations under the contract, unless other arrangement satisfactory to the ENGINEER are made with the owner of the pipelines, duct, main, irrigation line, sewer, storm drain, pole, or wire or cable. The CONTRACTOR shall be responsible for and shall repair all damage due to CONTRACTOR'S operations, and the provisions of this section shall not be abated even in the event such damage occurs after backfilling or is not discovered until after completion of the backfilling.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

PART 1 – GENERAL

1.1 HIGHWAY LIMITATIONS

- A. The CONTRACTOR shall make its own investigation of the condition of available public and private roads and of clearances, restrictions, bridge load limits, and other limitations affecting transportation and ingress and egress to the site of the WORK. It shall be the CONTRACTOR's responsibility to construct and maintain any haul roads required for its construction operations.

1.2 TEMPORARY CROSSINGS

- A. General. Continuous, unobstructed, safe, and adequate pedestrian and vehicular access shall be provided to fire hydrants, commercial and industrial establishments, private residences, churches, schools, parking lots, service stations, motels, fire and police stations, clinics and hospitals. The CONTRACTOR shall cooperate with parties involved in the delivery of mail and removal of trash and garbage so as to maintain existing schedules for such services.

1.3 MAINTENANCE OF TRAFFIC

- A. General. Unless otherwise provided, the project building site shall not interfere with traffic along Broadway Street. Nothing herein shall be construed to entitle the CONTRACTOR to the exclusive use of any public street, alleyway, or parking area during the performance of the WORK hereunder. The CONTRACTOR shall provide unimpeded access through the Project limits for emergency vehicles and make every effort to provide minimum delay to United States Postal Service vehicles and garbage collection vehicles.
- B. The CONTRACTOR shall submit three (3) copies of a traffic control plan (TCP) to the ENGINEER for approval a minimum of two (2) weeks prior to construction. The ENGINEER reserves the right to observe these traffic control plans in use and to make any changes as field conditions warrant. Any changes shall supersede these TCPs and be done solely at the CONTRACTOR's expense.
- C. No street shall be closed to the public without first obtaining written permission of the ENGINEER and any proper governmental authority. Where so provided on the Drawings or otherwise approved by the ENGINEER, the CONTRACTOR may by-pass traffic over a detour route. When no longer required, the detour shall be removed and the approach obliterated.
- D. Temporary provisions shall be made by the CONTRACTOR to assure the use of sidewalks and the full functioning of all gutters, storm drain inlets, and other drainage facilities.
- E. The CONTRACTOR's equipment shall stop at all points of intersection with the traveling public unless satisfactory traffic control measures, approved in writing by the ENGINEER, are installed and maintained at the CONTRACTOR's expense.

- F. When the CONTRACTOR is required to maintain traffic through sidewalk or plaza installation, the construction shall be conducted in such a manner as to provide a reasonably smooth and even surface satisfactory for use by public traffic at all times and safe for use by public traffic at all times.
- G. At intervals of 48 hours and 24 hours prior to startup of construction operations, and at weekly intervals during the construction period, the CONTRACTOR shall advertise in the Skagway News (bi-weekly publication) and have broadcast on all local radio stations the precise location, time of commencement, and proposed completion date of the WORK scheduled for the following week which will require detouring or otherwise effect public traffic. Detours shall be described in sufficient detail to efficiently inform the traveling public of the modified traffic pattern. The cost of these advertisements shall be considered incidental to other contract bid items. The CONTRACTOR will notify the property owners 24 hours prior to commencement of WORK.
- H. When, in the opinion of the ENGINEER, conditions are such that the safety and/or convenience of the traveling public may be adversely affected, the CONTRACTOR will be immediately notified in writing. The notice will state the defect(s) and the corrective action(s) required. In the event that the CONTRACTOR neglects to take immediate corrective action, the ENGINEER may suspend all WORK on the Project until satisfactory corrective action is performed. In the event the CONTRACTOR does not take corrective action within 24 hours, the ENGINEER may order such WORK as deemed necessary for public convenience and safety accomplished by outside forces. The cost of this WORK shall be deducted from any monies due or that may become due under the terms of the contract.
- I. Traffic Control. All locations requiring redirection or stopping of the traveling public shall be properly signed and/or flagged by the CONTRACTOR. For the protection of traffic in public or private streets and ways, the CONTRACTOR shall provide, flaggers and provide, place, and maintain all necessary barricades, traffic cones, warning signs, lights, and other safety devices in accordance with the requirements of the "Manual of Uniform Traffic Control Devices, (MUTCD) published by U.S. Department of Transportation, Federal Highway Administration (ANSI D6.1) with the current State of Alaska supplement.
- J. The CONTRACTOR shall take all necessary precautions for the protection of the WORK and the safety of the public. All barricades and obstructions shall be illuminated at night, and all lights shall be kept burning from sunset until sunrise. The CONTRACTOR shall station such guards or flaggers and shall conform to such special safety regulations relating to traffic control as may be required by the public authorities within their respective jurisdictions. All signs, signals, and barricades shall conform to the requirements of Subpart G, Part 1926, of the OSHA Safety and Health Standards for Construction.
- K. Provide pedestrian detours in areas adjacent to new construction due to demolition of existing sidewalks and other structures. The CONTRACTOR shall provide smooth, graded pathways, free of mud, muck and other materials that will be objectionable to people in street shoes. The pathways shall be a minimum of 36-inches wide, and shall be clearly marked with staking, warning ribbons, or other methods to guide pedestrians through the construction areas and to their residence walkways, if applicable.

- L. The CONTRACTOR shall remove traffic control devices when no longer needed, repair all damage caused by installation of the devices, and shall remove post settings and backfill the resulting holes to match grade.
- M. The CONTRACTOR shall notify the Skagway Police and Fire Departments and any other affected agency of all planned street closures. Notification shall consist of giving the time of commencement and proposed date of completion of WORK and names of streets, schedule of operations, and routes of detours. Such notification shall be given at least 48 hours before such closure is to take effect.
- N. On-Site Cellular Phones. The CONTRACTOR shall maintain one (1) active cellular phone at the Project site at all times with the phone number provided to the Skagway Fire, Police and Engineering Departments. The cellular phone shall be carried by the person in charge of the field operations.

1.4 CONTRACTOR'S WORK AND STORAGE AREA

- A. The CONTRACTOR shall make its own arrangements for any necessary off-site storage or shop areas necessary for the proper execution of the WORK.
- B. Should the CONTRACTOR find it necessary to use any additional land for other purposes during the construction of the WORK, it shall provide for the use of such lands at its own expense.
- C. The CONTRACTOR shall construct and use a separate storage area for hazardous materials used in constructing the WORK.
 - 1. For the purpose of this paragraph, hazardous materials to be stored in the separate area are all products labeled with any of the following terms: Warning, Caution, Poisonous, Toxic, Flammable, Corrosive, Reactive, or Explosive, and other materials and products considered hazardous materials under federal law. In addition, whether or not so labeled, the following materials shall be stored in the separate area: diesel fuel, gasoline, new and used motor oil, hydraulic fluid, cement, paints, and paint thinners, two-part epoxy coatings, sealants, asphaltic products, glues, solvents, wood preservatives, sand blast materials, and spill absorbent.
 - 2. The CONTRACTOR shall develop and submit to the ENGINEER a plan for storing and disposing of the materials above.
 - 3. The separate storage area shall meet all the requirements of all authorities having jurisdiction over the storage of hazardous materials.
 - 4. The separate storage area shall be inspected by the ENGINEER prior to construction of the area, upon completion of construction of the area, and upon clean-up and removal of the area.
 - 5. All hazardous materials which are delivered in containers shall be stored in the original containers until use. Hazardous materials which are delivered in bulk shall be stored in containers which meet the requirements of authorities having jurisdiction.

1.5 PARKING

- A. The CONTRACTOR shall direct its employees to park in areas as directed by the MOS.
- B. Traffic and parking areas shall be maintained in a sound condition, free of excavated material, construction equipment, mud, and construction materials. The CONTRACTOR shall repair breaks, potholes, low areas which collect standing water, and other deficiencies.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DUST ABATEMENT

- A. The CONTRACTOR shall furnish all labor, equipment, and means required and shall carry out effective measures wherever and as often as necessary to prevent its operation from producing dust in amounts potentially damaging to property, cultivated vegetation, or domestic animals, or causing a nuisance to persons living in or occupying buildings in the vicinity. The CONTRACTOR shall be responsible for any damage resulting from any dust originating from its operations. The dust abatement measures shall be continued until dust is no longer produced and the CONTRACTOR is relieved of further responsibility by the OWNER in writing by the ENGINEER.

1.3 RUBBISH CONTROL

- A. During the progress of the WORK, the CONTRACTOR shall keep the site of the WORK and other areas used by it in a neat and clean condition, and free from any accumulation of rubbish. The CONTRACTOR shall dispose of all rubbish and waste materials of any nature occurring at the WORK site, and shall establish regular intervals of collection and disposal of such materials and waste. No burning is permitted on site. The CONTRACTOR shall also keep its haul roads free from dirt, rubbish, and unnecessary obstructions resulting from its operations. Disposal of all rubbish and surplus materials shall be off the site of construction in accordance with local codes and ordinances governing locations and methods of disposal, and in conformance with all applicable safety laws, and to the particular requirements of Part 1926 of the OSHA Safety and Health Standards for Construction.

1.4 SANITATION

- A. Toilet Facilities: Fixed or portable chemical toilets shall be provided wherever needed for the use of employees. Toilets at construction job sites shall conform to the requirements of Part 1926 of the OSHA Standards for Construction.
- B. Sanitary and Other Organic Wastes: The CONTRACTOR shall establish a regular daily collection of sanitary and organic wastes. All wastes and refuse from sanitary facilities provided by the CONTRACTOR or organic material wastes from any other source related to the CONTRACTOR's operations shall be disposed of away from the site in a manner satisfactory to the ENGINEER and in accordance with all federal, state and local laws and regulations.

1.5 CHEMICALS

- A. All chemicals used during Project construction or furnished for Project operation, whether defoliant, soil sterilant, herbicide, pesticide, disinfectant, polymer, reactant or of other classification, shall show approval of either the U.S. Environmental Protection Agency or the U.S. Department of Agriculture. Use of all such chemicals and disposal of residues shall be in strict accordance with the printed instructions of the manufacturer. In addition, see the requirements set forth in paragraph 6.11 of the General Conditions.

1.6 EAGLE NESTING TREES

- A. Eagle nesting trees are known to exist in the Skagway area, although none are known to exist in the immediate vicinity of the Project site. The CONTRACTOR has the responsibility for adherence to the Bald Eagle Protection Act (16 U.S.C. 668-668d) which prohibits molesting or disturbing bald eagles, their nests, eggs, or young.
- B. Guidelines for compliance to the Bald Eagle Protection Act are supervised by the U.S. Department of the Interior, Fish and Wildlife Service, Raptor Management Studies, 3000 Vintage Blvd, Suite 240, Juneau, Alaska 99801, phone (907) 780-1163. The contact person is Steve Lewis, Eagle Management Specialist. The CONTRACTOR shall contact the Eagle Management Specialist for guidelines of the Bald Eagle Protection Act.

PART 2 - PRODUCTS (Not Used)

PART 3- EXECUTION (Not Used)

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. The WORK under this Section includes providing all labor, materials, tools and mobilization and demobilization for any equipment necessary to maintain temporary erosion control devices; including, but not limited to, silt sacks in storm drain structures, straw wattles, silt fences, vehicle tracking areas, rock check dams, ditches, etc.
- B. The WORK also includes sweeping, watering, and vacuuming of the existing asphalt roadways including, but not limited to, Broadway Street.

1.3 DEFINITIONS

- A. Erosion and Sediment Control Plan (ESCP). Permanent and temporary prevention of erosion and control of sedimentation during construction of the Project is included in the project Plans and Specifications.
- B. Final Stabilization. That point when all soil disturbing activities resulting from the project have been completed and a live uniform blanket of perennial vegetation, to preclude erosion, has been established on all unpaved areas (excluding graveled shoulders and crushed aggregate base course) not covered by permanent structures or equivalent permanent stabilization measures, such as use of riprap, gabions or geotextiles, have been implemented.
- E. Best Management Practices (BMP's). A wide range of project management practices, schedules of activities or prohibition of practices that when used singly or in combination, prevent or reduce erosion, sedimentation and pollution of adjacent water bodies and wetlands. BMP's include both structural devices and non-structural practices and can be temporary or permanent. The State of Alaska DOT/PF Best management Practices for Construction Erosion and Sediment Control describes a variety of standard BMP's.

1.4 SUBMITTALS

- A. Erosion and sediment control plan.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

- A. Do not begin earth disturbing work until written approval of the Erosion and Sediment Control plan has been approved.

- B. Contain, clean up, and dispose of all construction related (including office facilities) discharges of petroleum products and/or other materials hazardous to the land, air, water and organic life forms. Perform all fueling operations in a safe and environmentally responsible manner. Comply with the requirements of 18 AAC 75 and AS 46, Oil and Hazardous Substances Pollution Control.
- C. Implement all temporary and permanent erosion and sediment control measures identified in the Erosion and Sediment Control plan.
- D. If a storm event occurs, where storm water discharges pose a threat to water quality, take immediate suitable action to preclude erosion and pollution.
- E. Prior to winter shutdown, ensure that the site has been stabilized. Prior to project closeout and demobilization, the ENGINEER will review all areas disturbed by construction to determine if final stabilization is complete.
- F. The Contractor shall maintain existing temporary erosion control structures as necessary and/or as directed by the OWNER or ENGINEER for the duration of the contract. They shall be maintained in effective operating conditions at all times. Rock check dams, straw wattles and silt fences shall be cleaned whenever they have become half-filled with silt or debris, and other items shall be cleaned, repaired, or replaced as necessary.
- G. Temporary erosion control structures shall remain in place until the OWNER approves their removal.

END OF SECTION

PART 1 - GENERAL

1.1 FINAL CLEAN UP

- A. The CONTRACTOR shall promptly remove from the vicinity of the completed WORK, all rubbish, unused materials, concrete forms, construction equipment, and temporary structures and facilities used during construction. Final acceptance of the WORK by the OWNER will be withheld until the CONTRACTOR has satisfactorily complied with the foregoing requirements for final clean-up of the Project site.

1.2 CLOSEOUT TIMETABLE

- A. The CONTRACTOR shall establish dates for equipment testing, acceptance periods, and on-site instructional periods as required under the contract. Such dates shall be established not less than one (1) week prior to beginning any of the foregoing items, to allow the OWNER, the ENGINEER and their authorized representatives sufficient time to schedule attendance at such activities.

1.3 FINAL SUBMITTALS

- A. The CONTRACTOR, prior to requesting final payment, shall obtain and submit the following items to the ENGINEER for transmittal to the OWNER:
 - 1. Written guarantees, where required
 - 2. Maintenance stock items; spare parts; special tools, where required
 - 3. Completed Record Drawings, O&M Manuals, Start-up Reports
 - 4. Certificates of inspection and acceptance by local governing agencies having jurisdiction
 - 5. Releases from all parties who may be entitled to claims against the subject Project, property, or improvement pursuant to the provisions of law
 - 6. Compliance Certificate and Release, signed by the CONTRACTOR, shall be submitted to the Engineering Contract Administrator.
- B. Before final payment can be made, the CONTRACTOR shall supply a copy of the "Notice of Completion of Public Works" form approved by Wage and Hour Administration of the Labor Standards and Safety Division of the Alaska Department of Labor and Workforce Development.
- C. Before final payment, the CONTRACTOR shall provide the Engineering Contract Administrator with clearance from the Alaska Department of Labor and Workforce Development for the CONTRACTOR and all Subcontractors that have worked on the Project. This clearance shall indicate that all Employment Security Taxes have been paid. A sample form for this purpose is at the end of Section 000800 – Supplementary General Conditions.

1.4 WARRANTY AND GUARANTEE

- A. The CONTRACTOR shall comply with the warranty and guarantee requirements contained in Article 13 of the General Conditions.

- B. Replacement of earth fill or backfill, where it has settled below the required finish elevations, shall be considered as part of such required repair WORK, and any repair or resurfacing constructed by the CONTRACTOR which becomes necessary by reason of such settlement shall likewise be considered as part of such required repair WORK unless the CONTRACTOR shall have obtained a statement in writing from the affected private owner or public agency releasing the OWNER from further responsibility in connection with such repair or resurfacing and which includes provision by the CONTRACTOR to defend and indemnify the OWNER against all claims .

- C. The CONTRACTOR shall make all repairs and replacements promptly upon receipt of written order from the OWNER. If the CONTRACTOR fails to make such repairs or replacements promptly, the OWNER reserves the right to do the WORK and the CONTRACTOR and the CONTRACTOR's surety shall be liable to the OWNER for the cost.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

COMPLIANCE CERTIFICATE AND RELEASE FORM
NEXT PAGE

COMPLIANCE CERTIFICATE AND RELEASE FORM

PROJECT:
MUNICIPALITY OF SKAGWAY
Solid Waste Transfer Station

The CONTRACTOR must complete and submit this to the Contract Administrator with respect to the entire contract.

Completed forms may be submitted upon completion of the Project. All requirements and submittals must be met before final payment will be made to the CONTRACTOR.

I certify that the following and any referenced attachments are true:

- All WORK has been performed, materials supplied, and requirements met in accordance with the applicable Drawings, Specifications, and Contract Documents.
- All Suppliers and Subcontractors have been paid in full with no claims for labor, materials or other services outstanding. If all Subcontractors and suppliers are not paid in full, please explain on a separate sheet.
- All employees have been paid not less than the current prevailing wage rates set by the State of Alaska (or U.S. Department of Labor, as applicable).
- All equal employment opportunity, certified payroll and other reports have been filed in accordance with the prime contract.
- The attached list of Subcontractors is complete (required from CONTRACTOR). The Municipal Engineer was advised and approved of all Subcontractors before WORK was performed and has approved any substitutions of Subcontractors.
- All DBE firms listed as a precondition of the prime contract award must have performed a commercially useful function in order for the WORK to count to a DBE goal. All DBE firms performed the WORK stated and have received at least the amount claimed for credit in the Contract Documents.
- All DBE Subcontractors must attach a signed statement of the payment amount received, the nature of WORK performed, whether any balance is outstanding, and indicate that no rebates are involved.
- If the amount paid is less than the amount originally claimed for DBE credit, the CONTRACTOR has attached approval from the Municipal Engineer for underutilization.

I understand it is unlawful to misrepresent information in order to receive a payment which would otherwise be withheld if these conditions were not met. I am an authorized agent of this firm and sign this freely and voluntarily. The foregoing statements are true and apply to the following project contractor.

Firm Name Capacity: CONTRACTOR

Signed Printed Name and Title Date

Municipality of Skagway
Pullen Creek R/V Park Restrooms

SECTION 001700
PROJECT CLOSE-OUT

Return completed form to: Doug Murray and Mark Pusich, P.E., Owner's Representative, RESPEC, 9109 Mendenhall Mall Road Suite 4, Juneau, AK 99801. Call (907) 780-6060 if we can be of further assistance or if you have any questions.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The WORK under this Section includes providing all supervision, labor, materials, tools and equipment and mobilization and demobilization for any equipment necessary for final clean-up and restoration of all areas disturbed by construction activities, to a condition equal to, or better than, before construction started. This does not include clean-up or restoration incidental to, or directly provided for by, other construction items.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Any materials required shall conform to the appropriate section of these Specifications.

PART 3 - EXECUTION

3.1 CONSTRUCTION

- A. The CONTRACTOR shall clean up all sites disturbed during construction of the Project. This includes removal of all construction equipment, disposal of all excess materials, disposal of all rubbish and debris, removal of all temporary structures, hydroseed overspray on existing site features, and grading of the sites so that no standing water is evident.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering.
 - 3. Installation.
 - 4. Progress cleaning.
 - 5. Starting and adjusting.
 - 6. Protection of installed construction.

- B. Related Requirements:
 - 1. Section 001010 "Summary of Work" for coordination of and limits on use of Project site.
 - 2. Section 001300 "Contractor Submittal" for submitting surveys.
 - 3. Section 001700 "Project Closeout" for replacing defective work, and final cleaning.
 - 4. Section 024119 "Selective Demolition" for demolition and reinstallation of equipment.

1.2 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.

- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.3 QUALITY ASSURANCE

- A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 - 1. Structural Elements: When cutting and patching structural elements, or when encountering the need for cutting and patching of elements whose structural function is not known, notify Owner's Representative of locations and details of cutting and await directions from Owner's Representative before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
 - 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:
 - a. Primary operational systems and equipment.
 - b. Control systems.

- c. Electrical wiring systems.
- 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety
- 4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Owner's Representative's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, gas service piping, and water-service piping; underground electrical services; and other utilities.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where

indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
1. Description of the Work, including Specification Section number and paragraph, and Drawing sheet number and detail, where applicable.
 2. List of detrimental conditions, including substrates.
 3. List of unacceptable installation tolerances.
 4. Recommended corrections.
- D. Proceed with installation only after unsatisfactory conditions have been corrected and approved by the ENGINEER. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

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

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks and existing conditions. If discrepancies are discovered, notify Owner's Representative and ENGINEER promptly.
- B. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- C. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and

electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

3.4 FIELD ENGINEERING

- A. Identification: Owner will identify existing benchmarks, control points, and property corners.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
 - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Owner's Representative. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Owner's Representative before proceeding.
 - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

3.5 INSTALLATION

- A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
 - 4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces, unless otherwise indicated on Drawings.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Sequence the Work and allow adequate clearances to accommodate movement of construction items on-site and placement in permanent locations.
- E. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.
- F. Templates: Obtain and distribute to the parties involved templates for Work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- G. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with

other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions with manufacturer.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Owner's Representative.
 2. Allow for building movement, including thermal expansion and contraction.
 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- H. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by Owner's Representative. Fit exposed connections together to form hairline joints.

3.6 CUTTING AND PATCHING

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Temporary Support: Provide temporary support of Work to be cut.
- C. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- D. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
 5. Proceed with patching after construction operations requiring cutting are complete.
- E. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as practicable, as judged by Owner's Representative. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 3. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 4. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- F. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 PROGRESS CLEANING

- A. Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
1. Do not hold waste materials for more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F
 2. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, in accordance with regulations.
 - a. Use containers intended for holding waste materials of type to be stored.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.
1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces in accordance with written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 017419 "Construction Waste Management and Disposal."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.9 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION

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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. Disposing of nonhazardous demolition and construction waste.
- B. Related Requirements:
 - 1. Section 311000 "Clearing and Grubbing" 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 become 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. Stop work and notify Owner and Engineer.

1.5 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.

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.1 SALVAGING DEMOLITION WASTE

- A. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:
 1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 3. Store items in a secure area until installation.
 4. Protect items from damage during transport and storage.
 5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

3.2 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. Burning: Do not burn waste materials.
- C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. The WORK under this Section includes providing all labor, materials, tools, equipment, mobilization and demobilization necessary for removing and disposing of the existing Pullen Creek R/V Park restroom. This includes but is not limited to metal roof, wall framing, concrete foundation, concrete slab, CMU walls, doors, drinking fountain, mechanical fixtures, electrical fixtures, mechanical plumbing, electrical wiring/conduit, salvaging existing equipment, removing and trimming back water and sewer services, removing existing underground propane line, removing and disposing of existing propane tank and slab, removing of select trees noted, and other miscellaneous items.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.
- B. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.
- C. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.
- D. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.
- E. Salvage: Carefully remove existing equipment in a manner to prevent damage and return to Owner as identified in the Drawings.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes the property of the CONTRACTOR. The CONTRACTOR shall be responsible for all disposal costs for the demolition of the building as shown on the Drawings.

1.5 PREINSTALLATION MEETINGS

- A. Pre-demolition Conference will be scheduled on site 72 hours prior to beginning building demolition work.
 - 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review structural load limitations of existing structure.

3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.6 FIELD CONDITIONS

- A. Conditions existing at time of inspection for bidding purpose will be maintained by OWNER as far as practical.
- B. Notify ENGINEER of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 1. If suspected hazardous materials are encountered, do not disturb; immediately notify ENGINEER and OWNER. Hazardous materials will be removed by OWNER under a separate contract.
- D. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1.7 COORDINATION

- A. Arrange selective demolition schedule so as not to interfere with OWNER's operations.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. CONTRACTOR to verify that existing underground utilities have been field located, disconnected and capped before starting selective demolition operations.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
- B. Existing Services/Systems to be removed: locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. OWNER will arrange to shut off indicated services/systems when requested by CONTRACTOR.
2. Disconnect, and salvage electrical and hot water heater, equipment, and components indicated on Drawings to be salvaged including existing above ground propane tank.
 - a. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - b. Equipment to Be Salvaged: Disconnect and cap services and remove, clean, and salvage equipment; return salvaged equipment and tank to MOS Public Works Shop.

3.3 PROTECTION

- A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

3.4 SELECTIVE DEMOLITION, GENERAL

- A. Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
 2. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
 3. Maintain fire watch during and for at least 1 hour after flame-cutting operations.
 4. Maintain adequate ventilation when using cutting torches.
 5. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 6. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
- B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- C. Removed and Salvaged Items:
 1. Clean salvaged items prior to crating.
 2. Pack or crate items after cleaning. Identify contents of containers.
 3. Protect items from damage during transport to MOS Public Works Shop and storage.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and dispose of them at an approved construction and demolition waste landfill. MOS will be charging CONTRACTOR's for disposing of construction waste soils or building demolition debris. Coordinate with MOS Public Works Director for current rates.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. Comply with requirements specified in Section 001741 "Construction Waste Management and Disposal."
- B. Burning: Do not burn demolished materials.

3.6 CLEANING

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

END OF SECTION 024119

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel reinforcement bars.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Each type of steel reinforcement.
2. Bar supports.

B. Shop Drawings: Comply with ACI SP-066:

1. Include placing drawings that detail fabrication, bending, and placement.
2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, tie spacing, hoop spacing, and supports for concrete reinforcement.

C. Construction Joint Layout: Indicate proposed construction joints required to build the structure.

1. Location of construction joints is subject to approval of Architect.

1.3 INFORMATIONAL SUBMITTALS

A. Material Test Reports: For the following, from a qualified testing agency:

B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.

B. Galvanized Reinforcing Bars:

1. Steel Bars: ASTM A615/A615M, Grade 60, deformed bars.

2.2 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars in place.
 - 1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.
- B. Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch in diameter.
 - 1. Finish: Plain.

2.3 FABRICATING REINFORCEMENT

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

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protection of In-Place Conditions:
 - 1. Do not cut or puncture vapor retarder.
 - 2. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

3.2 INSTALLATION OF STEEL REINFORCEMENT

- A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.
- B. Accurately position, support, and secure reinforcement against displacement.
 - 1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
 - 2. Do not tack weld crossing reinforcing bars.
- C. Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.
- D. Provide concrete coverage in accordance with ACI 318.
- E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

- F. Splices: Lap splices as indicated on Drawings.
 - 1. Bars indicated to be continuous, and all vertical bars to be lapped not less than 36 bar diameters at splices, or 24 inches, whichever is greater.
 - 2. Stagger splices in accordance with ACI 318.

3.3 JOINTS

- A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement.
 - 2. Continue reinforcement across construction joints unless otherwise indicated.
 - 3. Do not continue reinforcement through sides of strip placements of floors and slabs.

3.4 INSTALLATION TOLERANCES

- A. Comply with ACI 117.

3.5 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- C. Inspections:
 - 1. Steel-reinforcement placement.

END OF SECTION 032000

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PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete standards.
2. Concrete materials.
3. Admixtures.
4. Vapor retarders.
5. Floor and slab treatments.
6. Liquid floor treatments.
7. Curing materials.
8. Accessories.
9. Repair materials.
10. Concrete mixture materials.
11. Concrete mixture class types.
12. Concrete mixing.

B. Related Requirements:

1. Section 032000 "Concrete Reinforcing" for steel reinforcing bars.
2. Section 312003 "Base Course" for drainage fill under slabs-on-ground.
3. Section 321313 "Site Concrete" for concrete pavement and walks.

1.2 ACTION SUBMITTALS

A. Product data.

1. Portland cement.
2. Aggregates.
3. Admixtures:
 - a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.
4. Vapor retarders.
5. Liquid floor treatments.
6. Curing materials.
7. Joint Fillers.

B. Design Mixtures: For each concrete mixture, include the following:

1. Mixture identification.
2. Minimum 28-day compressive strength.
3. Durability exposure class.

4. Maximum w/cm ratio.
5. Slump limit.
6. Air content.
7. Nominal maximum aggregate size.
8. Intended placement method.
9. Submit adjustments to design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant changes.

C. Shop Drawings:

1. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, tie spacing, hoop spacing, and supports for concrete reinforcement.
2. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - a. Location of construction joints is subject to approval of the Architect.

1.3 INFORMATIONAL SUBMITTALS

A. Material certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Curing compounds.
4. Steel reinforcement.
5. Vapor retarders.
6. Joint-filler strips.

B. Material test reports: For the following, from a qualified testing agency:

1. Portland cement.
2. Aggregates.
3. Admixtures.

C. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.

1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

- B. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing that performs duties on behalf of the Architect/Engineer.
- C. Field Quality-Control Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

PART 2 - PRODUCTS

2.1 CONCRETE STANDARDS

- A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.3 CONCRETE MATERIALS

- A. Cementitious Materials:
 - 1. Portland Cement: ASTM C150/C150M, Type I/III,.
- B. Normal-Weight Aggregates:
 - A. Coarse Aggregate: ASTM C33/C33M, coarse aggregate or better, graded. Provide aggregates from a single source.
 - 1.
 - 2. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
 - 3. Fine Aggregate: ASTM C33/C33M.
 - 4. Recycled Aggregate: Provide documentation of characteristics of recycled aggregate and mechanical properties and durability of proposed concrete, which incorporates recycled aggregate to conform to applicable requirements for the class of concrete.
 - 5. Alkali-Silica Reaction: Comply with one of the following for each aggregate used:
 - a. Expansion Result of Aggregate: Not more than 0.04 percent at one year when tested in accordance with ASTM C1293.
 - b. Expansion Results of Aggregate and Cementitious Materials in Combination: Not more than 0.10 percent at an age of 16 days when tested in accordance with ASTM C1567.

2.4 Alkali Content in Concrete: Not to exceed 4 lb./cu. yd. for aggregate with expansion greater than or equal to 0.04 percent and less than 0.12 percent or 3 lb./cu. yd. for aggregate with expansion greater than or equal to 0.12 percent and less than 0.24 percent. Test aggregate reactivity in accordance with ASTM C1293. Calculate alkali content of concrete in accordance with ACI 301. ADMIXTURES

- A. Air-Entraining Admixture: ASTM C260/C260M.
- B. Chemical Admixtures: Do not use calcium chloride or admixtures containing calcium chloride in steel-reinforced concrete.
 - 1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
 - 2. Retarding Admixture: ASTM C494/C494M, Type B.
 - 3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
 - 5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.
 - 7. Admixtures with special properties, with documentation of claimed performance enhancement, ASTM C494/C494M, Type S.
- C. Mixing Water for Concrete Mixtures and Water Used to Make Ice: ASTM C1602/C1602M, potable.

2.5 VAPOR RETARDERS

- A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A; not less than 15 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.

2.6 LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.

2.7 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- B. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.
- C. Curing Paper: 8 ft. wide paper, consisting of two layers of fibered kraft paper laminated with double coating of asphalt.
- D. Water: Potable water that does not cause staining of the surface.
- E. Clear, Waterborne, Membrane-Forming, Dissipating Curing Compound: ASTM C309, Type 1, Class B.

- F. Clear, Waterborne, Membrane-Forming, Nondissipating Curing Compound: ASTM C309, Type 1, Class B.
- G. Clear, Waterborne, Membrane-Forming, Curing and Sealing Compound: ASTM C1315, Type 1, Class A.

2.8 ACCESSORIES

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber.
- B. Bonding Agent: ASTM C1059/C1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.
 - 1.

2.9 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301.
 - 1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.
- B. Admixtures: Use admixtures in accordance with manufacturer's written instructions.
 - 1. Use water-reducing, high-range water-reducing, or plasticizing admixture in concrete, as required, for placement and workability.
 - 2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 - 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs, concrete for parking structure slabs, and concrete with a w/cm below 0.50.

2.10 CONCRETE MIXTURES

- A. Normal-weight concrete used for footings, grade beams, and tie beams.
 - 1. Minimum Compressive Strength: 4500 psi at 28 days.
 - 2. Maximum w/cm: 0.45.
 - 3. Slump Limit: 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture at Project site.
 - 4. Air Content: 4-7%
 - a. Exposure Classes F3 – Exterior Footings: 5.5 percent, plus or minus 1.5 percent at point of delivery for concrete containing 3/4-inch nominal maximum aggregate size.
- B. Normal-weight concrete used for interior slabs-on-grades.
 - 1. Minimum Compressive Strength: 4500 psi at 28 days.

2. Maximum w/cm: 0.55.
3. Slump Limit: 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture at Project site.
4. Air Content: 0%.
 - a. Exposure Class F0: Do not allow air content of trowel-finished floors to exceed 3 percent.

2.11 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M, and furnish batch ticket information.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete in accordance with ASTM C94/C94M. Mix concrete materials in appropriate drum-type batch machine mixer.
 1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released.
 2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

CONCRETE MIXING

- C. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M and furnish delivery ticket.
- D. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete in accordance with ASTM C94/C94M. Mix concrete materials in appropriate drum-type batch machine mixer.
 1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released.
 2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Before placing concrete, verify that installation of concrete forms, accessories, reinforcement, and embedded items is complete and that required inspections have been performed.

- B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.
 - 1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.

3.3 INSTALLATION OF VAPOR RETARDERS

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

3.4 INSTALLATION OF CAST-IN-PLACE CONCRETE

- A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.
- B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.
- C. Water addition in transit or at the Project site must be in accordance with ASTM C94/C94M and must not exceed the permitted amount indicated on the concrete delivery ticket.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.

1. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.
 - a. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.
 - b. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 1. Do not place concrete floors and slabs in a checkerboard sequence.
 2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 3. Maintain reinforcement in position on chairs during concrete placement.
 4. Screed slab surfaces with a straightedge and strike off to correct elevations.
 5. Level concrete, cut high areas, and fill low areas.
 6. Slope surfaces uniformly to drains where required.
 7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
 8. Do not further disturb slab surfaces before starting finishing operations.

3.5 INSTALLATION OF JOINTS

- A. Construct joints true to line, with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.
 1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.
 2. Place joints perpendicular to main reinforcement.
 - a. Continue reinforcement across construction joints unless otherwise indicated.
 3. Locate joints for slabs at third points of spans. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:
 1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 2. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.

- D. Isolation Joints in Slabs-on-Ground: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated on Drawings.
 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface, where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

3.6 APPLICATION OF FINISHING FLOORS AND SLABS

A. Scratch Finish:

1. While still plastic, texture concrete surface that has been screeded and bull-floated or darbied.
2. Use stiff brushes, brooms, or rakes to produce a profile depth of 1/4 inch in one direction.
3. Apply scratch finish to surfaces to receive concrete floor toppings.

B. Float Finish:

1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.
2. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 tolerances for conventional concrete.
3. Apply float finish to surfaces to receive trowel finish.

C. Trowel Finish:

1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
2. Continue troweling passes and restraighen until surface is free of trowel marks and uniform in texture and appearance.
3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
4. Do not add water to concrete surface. Use of an approved finishing aid is acceptable.
5. Do not apply troweled finish to concrete, which has a total air content greater than 3 percent.
6. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring.
7. Finish and measure surface, so gap at any point between concrete surface and an unlevelled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 3/16 inch.

- D. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and locations indicated on Drawings.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with a fiber-bristle broom perpendicular to main traffic route.
2. Coordinate required final finish with Architect before application.

3.7 APPLICATION OF FINISHING FORMED SURFACES

A. As-Cast Surface Finishes:

1. ACI 301 (ACI 301M) Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.
 - a. Patch voids larger than 1-1/2 inches wide or 1/2 inch deep.
 - b. Remove projections larger than 1 inch.
 - c. Tie holes do not require patching.
 - d. Surface Tolerance: ACI 117, Class D.
 - e. Apply to concrete surfaces not exposed to public view.
2. ACI 301 (ACI 301M) Surface Finish SF-2.0: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.
 - a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
 - b. Remove projections larger than 1/4 inch.
 - c. Patch tie holes.
 - d. Surface Tolerance: ACI 117, Class B.
 - e. Locations: Apply to concrete surfaces exposed to public view, or to be covered with a coating or covering material applied directly to concrete.

B. Related Unformed Surfaces:

1. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a color and texture matching adjacent formed surfaces.
2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.8 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling in:

1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
2. Mix, place, and cure concrete, as specified, to blend in with in-place construction exposed to view.
3. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct concrete bases 4 inches high unless otherwise indicated on Drawings, and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated on Drawings, or unless required for seismic anchor support.
3. Minimum Compressive Strength: 4500 psi at 28 days.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
6. Prior to pouring concrete, place and secure anchorage devices.
 - a. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - b. Cast anchor-bolt insert into bases.
 - c. Install anchor bolts to elevations required for proper attachment to supported equipment.

3.9 APPLICATION OF CONCRETE CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

1. Comply with ACI 301 for cold weather protection during curing.
2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.
3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h, calculated in accordance with ACI 305R, before and during finishing operations.

B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:

1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
2. If forms remain during curing period, moist cure after loosening forms.
3. If removing forms before end of curing period, continue curing for remainder of curing period as follows:
 - a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
 - b. Continuous Sprinkling: Maintain concrete surface continuously wet.
 - c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
 - d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.
 - e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 - 1) Recoat areas subject to heavy rainfall within three hours after initial application.

- 2) Maintain continuity of coating and repair damage during curing period.

C. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:

1. Begin curing after finishing concrete.
2. Interior Concrete Floors:
 - a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:
 - 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than 12 inches.
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.
 - a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - b) Cure for not less than seven days.
 - 3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following not in cold weather:
 - a) Water.
 - b) Continuous water-fog spray.
 - b. Floors to Receive Penetrating Liquid Floor Treatments: Contractor has option of the following:
 - 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than 12 inches.
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.

- a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - b) Cure for not less than seven days.
- 3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
- a) Water.
 - b) Continuous water-fog spray.
- c. Floors to Receive Polished Finish: Contractor has option of the following:
- 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than 12 inches.
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 2) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
 - a) Water.
 - b) Continuous water-fog spray.
- d. Floors To Receive Curing Compound:
- 1) Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 - 2) Recoat areas subjected to heavy rainfall within three hours after initial application.
 - 3) Maintain continuity of coating, and repair damage during curing period.
 - 4) Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer.
- e. Floors To Receive Curing and Sealing Compound:
- 1) Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 - 2) Recoat areas subjected to heavy rainfall within three hours after initial application.
 - 3) Repeat process 24 hours later, and apply a second coat. Maintain continuity of coating, and repair damage during curing period.

3.10 APPLICATION OF LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment in accordance with manufacturer's written instructions.
 - 1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
 - 2. Do not apply to concrete that is less than seven days' old.
 - 3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing.
 - 4. Rinse with water; remove excess material until surface is dry.
 - 5. Apply a second coat in a similar manner if surface has received a float finish or abrasive surface preparation.
- B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller in accordance with manufacturer's written instructions.

3.11 INSTALLATION OF JOINT FILLING

- A. Prepare, clean, and install joint filler in accordance with manufacturer's written instructions.

3.12 INSTALLATION OF CONCRETE SURFACE REPAIRS

- A. Defective Concrete:
 - 1. Repair and patch defective areas when approved by Architect.
 - 2. Remove and replace concrete that cannot be repaired and patched to meet specification requirements.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks in excess of 0.01 inch spalls, air bubbles exceeding surface finish limits, honeycombs, rock pockets, fins and other projections on the surface exceeding surface finish limits, and stains and other discolorations that cannot be removed by cleaning.
 - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete.
 - a. Limit cut depth to 3/4 inch.
 - b. Make edges of cuts perpendicular to concrete surface.
 - c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
 - d. Fill and compact with patching mortar before bonding agent has dried.
 - e. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement, so that, when dry, patching mortar matches surrounding color.
 - a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.
 - b. Compact mortar in place and match surrounding surface.
3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance, as determined by Architect.

D. Repairing Unformed Surfaces:

1. Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each surface.
 - a. Correct low and high areas.
 - b. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
2. Repair finished surfaces containing surface defects, including spalls, popouts, honeycombs, rock pockets, crazing, and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width.
3. After concrete has cured at least 14 days, correct high areas by grinding.
4. Correct localized low areas during, or immediately after, completing surface-finishing operations by adding patching mortar.
 - a. Finish repaired areas to blend into adjacent concrete.
5. Correct other low areas scheduled to receive floor coverings with a repair underlayment.
 - a. Prepare, mix, and apply repair underlayment and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 - b. Feather edges to match adjacent floor elevations.
6. Correct other low areas scheduled to remain exposed with repair topping.
 - a. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations.
 - b. Prepare, mix, and apply repair topping and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
7. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete.
 - a. Remove defective areas with clean, square cuts, and expose steel reinforcement with at least a 3/4-inch clearance all around.
 - b. Dampen concrete surfaces in contact with patching concrete and apply bonding agent.

- c. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate.
 - d. Place, compact, and finish to blend with adjacent finished concrete.
 - e. Cure in same manner as adjacent concrete.
 8. Repair random cracks and single holes 1 inch or less in diameter with patching mortar.
 - a. Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt, and loose particles.
 - b. Dampen cleaned concrete surfaces and apply bonding agent.
 - c. Place patching mortar before bonding agent has dried.
 - d. Compact patching mortar and finish to match adjacent concrete.
 - e. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.13 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.
- B. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
 1. Testing agency to be responsible for providing curing facility for initial curing of strength test specimens on-site and verifying that test specimens are cured in accordance with standard curing requirements in ASTM C31/C31M.
 2. Testing agency to immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
 3. Testing agency to report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.
 - a. Test reports to include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:
 - 1) Project name.
 - 2) Name of testing agency.
 - 3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
 - 4) Name of concrete manufacturer.
 - 5) Date and time of inspection, sampling, and field testing.
 - 6) Date and time of concrete placement.
 - 7) Location in Work of concrete represented by samples.
 - 8) Date and time sample was obtained.
 - 9) Truck and batch ticket numbers.

- 10) Design compressive strength at 28 days.
 - 11) Concrete mixture designation, proportions, and materials.
 - 12) Field test results.
 - 13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
 - 14) Type of fracture and compressive break strengths at seven days and 28 days.
- C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.
- D. Inspections:
1. Headed bolts and studs.
 2. Verification of use of required design mixture.
 3. Concrete placement, including conveying and depositing.
 4. Curing procedures and maintenance of curing temperature.
 5. Verification of concrete strength before removal of shores and forms from beams and slabs.
 6. Batch Plant Inspections: On a random basis, as determined by Architect.
- E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M to be performed in accordance with the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
 - a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing is to be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 2. Slump: ASTM C143/C143M:
 - a. One test at point of delivery for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - b. Perform additional tests as needed.
 3. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete;
 - a. One test for each composite sample when strength test specimens are cast, but not less than one test for each day's pour of each concrete mixture.
 4. Concrete Temperature: ASTM C1064/C1064M:
 - a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample when strength test specimens are cast.
 5. Unit Weight: ASTM C138/C138M density of fresh structural lightweight concrete.

- a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture. The fresh density should be consistent with that associated with the equilibrium density within a tolerance of plus or minus 4 lb/ft.³.
 6. Compression Test Specimens: ASTM C31/C31M:
 - a. Cast and standard cure two sets of two 6 inches by 12-inches or 4-inch by 8-inch cylindrical specimens for each composite sample.
 - b. Cast, and field cure two sets of two standard cylindrical specimens for each composite sample.
 7. Compressive-Strength Tests: ASTM C39/C39M.
 - a. Test one set of two standard cured specimens at seven days and one set of two specimens at 28 days.
 - b. Test one set of two field-cured specimens at seven days and one set of two specimens at 28 days.
 - c. A compressive-strength test to be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
 8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor to evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
 9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests of standard cured cylinders equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi if specified compressive strength is 5000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.
 10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
 11. Additional Tests:
 - a. Testing and inspecting agency to make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
 - b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.
 - 1) Acceptance criteria for concrete strength to be in accordance with ACI 301, Section 1.7.6.3.
 12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- F. Measure floor and slab flatness and levelness in accordance with ASTM E1155 within 48 hours of completion of floor finishing and promptly report test results to Architect.

3.14 PROTECTION

- A. Protect concrete surfaces as follows:
 - 1. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION 033000

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PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Framing with dimension lumber.
2. Wood blocking and nailers.
3. Plywood backing panels.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For each type of process and factory-fabricated product.
2. For preservative-treated wood products.

1.3 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.

B. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.
2. Post-installed anchors.
3. Metal framing anchors.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

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.

B. Maximum Moisture Content:

1. Dimension Lumber: 19 percent for 2-inch nominal thickness or less; no limit for more than 2-inch nominal thickness unless otherwise indicated.

2.2 PRESERVATIVE TREATMENT

- 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. 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.
- D. Application: Treat items indicated on Drawings, and the following:
 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with concrete.
 3. Wood framing and furring attached directly to the interior of below-grade exterior concrete walls.
 4. Wood framing members that are less than 18 inches above the ground in unexcavated areas.
 5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 DIMENSION LUMBER FRAMING

- A. Non-Load-Bearing Interior Partitions by Grade: Standard, Stud, or No. 3 grade.
 1. Application: Interior partitions not indicated as load bearing.
 2. Species:
 - a. Northern species; NLGA.
 - b. Western woods; WCLIB or WWPA.
- B. Framing Other Than Non-Load-Bearing Partitions by Grade: No. 2 grade.
 1. Application: Framing other than interior partitions not indicated as load bearing.
 2. Species:
 - a. Douglas fir-larch; WCLIB or WWPA.
 - b. Douglas fir-larch (north); NLGA.

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. Rooftop equipment bases and support curbs.
 - 4. Cants.
 - 5. Furring.
 - 6. Grounds.
- B. Dimension Lumber Items: Standard, Stud, or No. 3 grade lumber of any species.
- C. Concealed Boards: 19 percent maximum moisture content and any of the following species and grades:
 - 1. Northern species; No. 2 Common grade; NLGA.
 - 2. Western woods; Standard or No. 3 Common grade; WCLIB or WWPA.

2.5 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: Plywood, DOC PS 1, Exterior, A-C, in thickness indicated or, if not indicated, not less than 1/2-inch nominal thickness.

2.6 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/A153M.
- B. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193 or ICC-ES AC308 as appropriate for the substrate.

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 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-preserved-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 metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- D. Do not splice structural members between supports unless otherwise indicated.
- E. Comply with AWPAC M4 for applying field treatment to cut surfaces of preservative-treated lumber.
- F. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
 2. ICC-ES evaluation report for fastener.

3.2 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 rough carpentry from weather. If, despite protection, rough carpentry becomes wet enough that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Wall sheathing.
 - 2. Roof sheathing.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product.

1.3 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For the following, from ICC-ES:
 - 1. Wood-preserved-treated plywood.

PART 2 - PRODUCTS

2.1 PRESERVATIVE-TREATED PLYWOOD

- A. Preservative Treatment by Pressure Process: AWWA 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.
- 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 concrete or used with roofing, flashing, vapor barriers, and waterproofing.

2.2 WALL SHEATHING

- A. Plywood Sheathing, Walls: Either DOC PS 1 or DOC PS 2, Exterior, Structural I sheathing.

2.3 ROOF SHEATHING

- A. Plywood Sheathing, Roofs: Either DOC PS 1 or DOC PS 2, Exterior, Structural I sheathing.

2.4 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 wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.

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, complying with the following:
 - 1. Table 2304.10.1, "Fastening Schedule," in the ICC's International Building Code.
 - 2. ICC-ES evaluation report for fastener.
- D. Coordinate wall and 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.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

- 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. Wall and Roof Sheathing:
 - a. Nail to wood framing.
 - b. Space panels 1/8 inch apart at edges and ends.

END OF SECTION 061600

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Wood roof trusses.
 - 2. Wood girder trusses.

1.2 ALLOWANCES

- A. Provide wood truss bracing under the Metal-Plate-Connected Truss Bracing Allowance as specified in Section 012100 "Allowances."

1.3 ACTION SUBMITTALS

- A. Product Data: For 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.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For metal-plate-connected wood trusses, signed by officer of truss-fabricating firm.
- B. Evaluation Reports: For the following, from ICC-ES:
 - 1. Metal-plate connectors.
 - 2. Metal truss accessories.

1.5 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.
- 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.

1.6 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."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," 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.
- 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 DIMENSION LUMBER

- 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. Provide dry lumber with 19 percent maximum moisture content at time of dressing.
- B. Permanent Bracing: Provide wood bracing that complies with requirements for miscellaneous lumber in Section 061000 "Rough Carpentry."

2.3 METAL CONNECTOR PLATES

- A. Fabricate connector plates to comply with TPI 1.
- B. 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.

2.4 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, 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.

2.5 METAL FRAMING ANCHORS AND ACCESSORIES

- A. Allowable design loads, as published by manufacturer, are to comply with 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.

2.6 FABRICATION

- A. 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.
- B. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

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. 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.
- F. Securely connect each truss ply required for forming built-up girder trusses.
- G. 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.
- H. Install wood trusses within installation tolerances in TPI 1.
- I. Do not alter trusses in field. Do not cut, drill, notch, or remove truss members.
- J. Replace wood trusses that are damaged or do not comply with requirements.

END OF SECTION 061753

SECTION 062023 - INTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Window head, Jamb and Sill.

B. RELATED SECTIONS

1. Section 079200 Joint Sealants
2. Section 099000 Paints and Coatings

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures and colors.
- B. Sustainable Design Submittals:
1. None required.
- C. Samples: For each exposed product and for each color and texture specified.

1.3 QUALITY ASSURANCE

- A. Certified Wood: Provide an invoice including vendor's chain-of-custody number, product cost, and entity being invoiced.
- B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

1.4 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, and HVAC system is operating and maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Do not install finish carpentry materials that are wet, moisture damaged or mold damaged.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Certified Wood: Certify the following wood products as "FSC Pure" or "FSC Mixed Credit" in accordance with FSC STD-01-001 and FSC STD-40-004.
 - 1. Interior Trim
- B. Composite Wood Products: Verify products are made using ultra-low-emitting formaldehyde resins, as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products," or are made with no added formaldehyde.
- C. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with applicable rules of any rules-writing agency certified by the American Lumber Standard Committee's (ALSC) Board of Review. Grade lumber by an agency certified by the ALSC's 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, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by grading agency.
 - 3. Anticipated for framing at built up assemblies not otherwise covered under 061000 "Rough Carpentry."

2.2 INTERIOR TRIM AND BOARD PANELING

- A. Hardwood Lumber Trim for Transparent Finish (Stain or Clear Finish):
 - 1. Species and Grade: Hemlock; Clear
 - 2. Maximum Moisture Content: 10 percent.
 - 3. Finger Jointing: Not allowed.
 - 4. Veneered Material: Not allowed.
 - 5. Face Surface: Surfaced (smooth).
 - 6. Matching: Selected for compatible grain and color.
 - 7. Profiles Fabricated from Material Thicknesses:
 - a. 1"

2.3 MISCELLANEOUS MATERIALS

- A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.
- B. Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.

1. Verify adhesive complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 2. Verify adhesives have a VOC content of 30g/L or less.
- C. Multipurpose Construction Adhesive: Formulation, complying with ASTM D3498, that is recommended for indicated use by adhesive manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours unless longer conditioning is recommended by manufacturer.

3.2 INSTALLATION, GENERAL

- A. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials.
 1. Use concealed notches, rabbets and shims where substrate conditions including presence of fastener heads and membrane build-ups would otherwise prevent a level, plumb, true and properly aligned installation.
 2. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
 3. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
 4. Install to tolerance of 1/8 inch in 96 inches (3 mm in 2438 mm) for level and plumb. Install adjoining interior finish carpentry with 1/32-inch (0.8-mm) maximum offset for flush installation and 1/16-inch (1.5-mm) maximum offset for reveal installation.
 5. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

3.3 INSTALLATION OF STANDING AND RUNNING TRIM

- A. Board Paneling:
 1. Install in full lengths.
 2. Stagger end joints in random pattern to uniformly distribute joints on each wall.
 3. Select and arrange boards on each wall to minimize noticeable variations in grain character and color between adjacent boards.

END OF SECTION 062023

SECTION 066500 – SIMULATED WOOD TRIM PLASTIC SIMULATED WOOD TRIM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Cellular PVC trim boards for:

1. Corner boards.
2. Soffits
3. Fascia
4. Rake boards.

1.2 RELATED SECTIONS

1. Section 09 90 00 – Painting and Coating

1.3 REFERENCES

- A. ASTM D792 - Density and Specific Gravity of Plastics by Displacement.
- B. ASTM D570 - Water Absorption of Plastics.
- C. ASTM D638 - Tensile Properties of Plastics.
- D. ASTM D790 - Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials. ASTM D1761 - Mechanical Fasteners in Wood.
- E. ASTM D5420 - Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by means of a Striker Impacted by a Falling Weight.
- F. ASTM D256 - Determining the Pendulum Impact Resistance of Plastics.
- G. ASTM D696 - Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C with a Vitreous Silica Dilatometer.
- H. ASTM D635 - Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position. ASTM E84 - Surface Burning Characteristics of Building Materials.
- I. ASTM D648 - Deflection Temperature of Plastics Under Flexural Load in the Edge-wise Position. ASTM D3679 - Standard Specification for Rigid Poly Vinyl Chloride (PVC) Siding.

1.4 SUBMITTALS

- A. General: Submit under provisions of Section 01 30 00 – Administrative Requirements.
- B. Product Data: Manufacture's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation instructions and methods.

1.5 QUALITY ASSURANCE

1. Manufacturer Qualifications: Manufacturer with a minimum of 15 years producing PVC trim products.
2. Installer Qualifications: Installer with a minimum of 3 years' experience with the installation of PVC trim products.
3. Regulatory Requirements: Check with Local Building Code for installation requirements.
4. Variation in component length: -0.00 / +1.00" Variation in component width: $\pm 1/16$ "
3. Variation in component thickness: $\pm 1/16$ "
4. Variation in component edge cut: $\pm 2^\circ$
5. Variation in Density -0% + 10%

1.6 DELIVERY, STORAGE AND HANDLING

1. Trim materials should be stored on a flat and level surface on a full shipping pallet. Handle materials to prevent damage to product edges and corners.
2. Store materials under a protective covering to prevent jobsite dirt and residue from collecting on the boards.

1.7 WARRANTY

- A. Provide manufacturer's Limited Lifetime warranty against defects in manufacturing that cause the products to rot, corrode, delaminate, or excessively swell from moisture.

PART 2 -PRODUCTS

2.1 MANUFACTURES

1. Acceptable products: Basis of design, AZEK[®] Trimboards manufactured by The AZEK[®] Company, which is located at: 888 N Keyser Ave Scranton, PA 18508 or equal.
2. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 – Product Requirements

2.2 MATERIALS

- A. PVC: Free foam cellular PVC material with a small cell microstructure and density of .55 grams/cm³.
 - Material shall have a minimum physical and performance properties specified in the following Section C.
- B. Performance and physical characteristic requirements:
 - 1. Property
 - a. PHYSICAL Density
Water Absorption MECHANICAL Tensile Strength Tensile Modulus Flexural Strength Flexural Modulus
 - b. Nail Hold
 - c. Units
 - 1. ASTM Value Method
 - a. 0.55 D 792 0.15 D 570
 - b. 2256 D 638 144,000 D 638 3329 D 790 144,219 D 790
 - c. 35 D 1761
 - d. of
 - e. Screw Hold
 - f. Staple Hold
Gardner Impact
Charpy Impact (@23°C) THERMAL
Coefficient of Linear Expansion
 - g. Burning Rate
Flame Spread Index
Heat Deflection Temp 264 psi Oil Canning (@140°F)

3.1 INSTALLATION

- A. Manufacturer instructions:
 - 1. Comply with manufacturer's product catalog installation instructions and product technical bulletin instructions.
 - 1. Cutting: products can be cut using the same tools used to cut lumber.
 - 2. Carbide tipped blades designed to cut wood work well. Avoid fine tooth metal cutting blades.
 - 3. Rough edges from cutting may be caused by excessive friction, poor board support, or worn or improper tooling.
- B. Adhesives:
 - 1. Glue all joints such as window surrounds, long fascia runs, etc. with manufactured recommended adhesive, a cellular pvc cement, to prevent joint separation.
 - 2. The glue joint should be secured with a fastener and/or fastened on each side of the joint to allow adequate bonding time.

3. Adhesive has a working time of 10 minutes and will be fully cured in 24 hours.
4. Surfaces to be glued should be smooth, clean and in complete contact with each other.
5. Bonding to other substrates, various adhesives may be used. Consult adhesive manufacturer to determine suitability.

B. Sealants: Use urethane, polyurethane or acrylic based sealants without silicone.

3.2 FINISHES

A. Paint PVC Trim a custom color as recommended by manufacturers specifications.

B. Preparation:

1. No special surface preparations are required prior to painting - sanding is not necessary for paint adhesion.
2. Surface must be clean and dry.
3. Use a 100% acrylic latex paint with a Light Reflective Value (LRV) of 55 or higher.
4. Follow the paint manufacturer's recommendations to apply.

END OF SECTION 066500

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Board insulation at concrete slab
- B. Batt insulation and vapor retarder in exterior wall construction.

1.2 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete
- B. Section 061000 - Rough Carpentry.
- D. Section 092116 - Gypsum Board Assemblies

1.3 REFERENCE STANDARDS

- A. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2011be1.
- B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2012.
- C. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2012.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2012.
- E. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; 2012.
- F. ASTM C 423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2002a.
- G. ASTM C 1338: Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings; 2000
- H. SCAQMA -- SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
 - 1. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition; www.aqmd.gov.
- I. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; current edition.

1.4 PERFORMANCE REQUIREMENTS

- A. Plenum Rating: Provide glass and slag-wool-fiber/rock-wool-fiber insulation where indicated in ceiling plenums whose test performance is rated as follows for use in plenums as determined by testing identical products per "Erosion Test" and "Mold Growth and Humidity Test" described in UL 181, or on comparable tests from another standard acceptable to authorities having jurisdiction.
 - 1. Erosion Test Results: Insulation shows no visible evidence of cracking, flaking, peeling, or

delamination of interior surface of duct assembly, after testing for 4 hours at 2500-fpm (13-m/s) air velocity.

2. Mold Growth and Humidity Test Results: Insulation shows no evidence of mold growth, delamination, or other deterioration due to the effects of high humidity, after inoculation with *Chaetomium globosum* on all surfaces and storing for 60 days at 100 percent relative humidity in the dark.

1.5 SUBMITTALS

- A. Product Data: Provide data on product characteristics, performance criteria, and product limitations.
- B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.7 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of building insulation through one source.

1.8 MOCK UP

- A. None required up.

1.9 FIELD CONDITIONS

- A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

1.10 SEQUENCING

- A. Sequence work to ensure fireproofing and firestop materials are in place before beginning work of this section.

PART 2 PRODUCTS

2.1 APPLICATIONS

- A. Insulation at Perimeter of Foundation and below slabs: Extruded polystyrene board; Type IV, 30psi
- B. Insulation below slabs: Extruded polystyrene board; Type IV, 30 psi
- C. Mineral Fiber Insulation at exterior wall stud cavities.

2.2 FOAM BOARD INSULATION MATERIALS

- A. Extruded Polystyrene Board Insulation: ASTM C578, Type IV; Extruded polystyrene board with natural skin surfaces; with the following characteristics:
 1. Flame Spread Index: 75 or less, when tested in accordance with ASTM E84.

2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
 3. Board Size: 48 x 96 inch.
 4. Board Thickness: 3 inches.
 5. Board Edges: Square.
 6. Thermal Conductivity (k factor) at 25 degrees F: 0.18.
 7. Compressive Resistance: 30 psi.
 - a. Manufacturers:
 - 1) Dow Chemical Co; STYROFOAM SM www.dow.com.(Basis of Design)
 - 2) Owens Corning Corp: www.owenscorning.com.
 - 3) DiversiFoam; www.diversifoam.com
 - 4) Or approved equal.
- B. Extruded Polystyrene Board Insulation,(INSUL 1A, WDW WALL INSUL, MTL PNL 1&2): ASTM C578, Type X; Extruded polystyrene board with natural skin surfaces; with the following characteristics:
1. Flame Spread Index: 75 or less, when tested in accordance with ASTM E84.
 2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
 3. Board Size: 48 x 96 inch.
 4. Board Thickness: as detailed.
 5. Board Edges: Square.
 6. Thermal Conductivity (k factor) at 25 degrees F: 0.18.
 7. Compressive Resistance: 25 psi.
 - a. Manufacturers:
 - 1) Dow Chemical Co; STYROFOAM CAVITYMATE www.dow.com.(Basis of Design)
 - 2) Owens Corning Corp: www.owenscorning.com.
 - 3) DiversiFoam; www.diversifoam.com
 - 4) Or approved equal.
- B. Polyisocyanurate Board Insulation (INSUL 3): Rigid cellular foam, complying with ASTM C 1289; FSC Certified Plywood one side, Glass fiber mat other side.
1. Installed as part of Section 074113 - Metal Roof Panels
 2. Flame Spread Index: 75 or less, when tested in accordance with ASTM E84.
 3. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
 4. Compressive Strength: 16 psi
 5. Board Size: 48 x 96 inch.
 6. Board Edges: Square.
 7. Manufacturers:
 - a. Atlas Roofing Corporation; Product AC Foam Nailbase: www.atlasroofing.com.
 - b. Rmax Roofing Products; Nailable Base 3; www.rmaxinc.com.
 - c. Or approved equal

2.3 THERMAL AND ACOUSTICAL INSULATION

- A. Mineral-Wool Blanket, Unfaced: ASTM C665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E84; passing ASTM E136 for combustion characteristics.
1. R-Value: 4.3 per inch.
 2. Facing: Unfaced.
 3. Facing: Foil-Faced.

4. Density: 8.0 pcf (nominal).
5. Surface Burning Characteristics: Tested in accordance with ASTM E84. Unfaced, maximum Flame Spread 0 and Smoke Developed 0; Foil-Faced, maximum Flame Spread 25 and Smoke Developed 0.
6. Fiber Type: EPA Choice fiber; minimum 75% pre-consumer recycled content; complies with EPA Preference Program.
7. Fiber Type: Standard fiber; 70% pre-consumer recycled content.
8. Post-Consumer Recycled Content: 0%.

2.5 ACCESSORIES

- A. Protection Board: Impact-resistant, nonstructural, gypsum and cellulose fiber panels with 95% certified recycled content. Uniform water-resistance throughout core and surface.
 1. Product: Securock manufactured by USG or equal
 2. Thickness: 1/2 inch
- D. Adhesive: Type recommended by insulation manufacturer for application.
 1. Use adhesive that has a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and containing no Urea Formaldehyde.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation and adhesive.
- B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions for attachment applicable to products and application indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice and snow.
- C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Water-Piping Coordination: If water piping is located on inside of insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.
- E. Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise shown or required to make up total thickness.

3.3 BOARD INSTALLATION AT FOUNDATION PERIMETER

- A. Adhere a 6 inch wide strip of polyethylene sheet over construction, control, and expansion joints with double beads of adhesive each side of joint.
 - 1. Extend sheet full height of joint.
- B. Install boards horizontally on foundation perimeter.
 - 1. Place boards to maximize adhesive contact.
- C. Extend boards over expansion joints, un-bonded to foundation on one side of joint.
- D. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.4 BLANKET INSULATION: Install in cavities formed by framing members according to the following requirements:

- 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
- 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
- 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
- 4. Attics: Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
- 5. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
- 6. For wood-framed construction, install blankets according to ASTM C1320 and as follows:
 - a. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.

3.7 PROTECTION

- A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Building wrap.
 2. Flexible flashing.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
1. For building wrap, include data on air and water-vapor permeance based on testing according to referenced standards.
- B. Shop Drawings: Show details of building wrap at terminations, openings, and penetrations. Show details of flexible flashing applications.

PART 2 - PRODUCTS

2.1 WATER-RESISTIVE BARRIER

- A. Building Wrap: ASTM E 1677, Type I air barrier; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.
- B. Building Wrap at Metal Siding
1. Basis of Design: VaproShield WrapShield IT. (www.vaproshield.com) or approved equal.
 2. Water-Vapor Permeance: Not less than 20 perms per ASTM E 96/E 96M, Desiccant Method (Procedure A).
 3. Air Permeance: Not more than 0.004 cfm/sq. ft. at 0.3-inch wg when tested according to ASTM E 2178.
 4. Allowable UV Exposure Time: Not less than three months.
 5. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.

2.2 FLEXIBLE FLASHING

- A. Membrane Flashing: self-adhesive, flashing product consisting of the same product as the weather barrier.
1. Basis-of-Design: VarpoShield "WrapFlashing SA" or approved equal.
 2. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.

3. Nails and Staples: Product recommended in writing by flexible flashing manufacturer and complying with ASTM F1667.

2.3 WATER-RESISTIVE BARRIER INSTALLATION

- A. Cover exposed exterior surface of sheathing with water-resistive barrier securely fastened to framing immediately after sheathing is installed.
- B. Cover sheathing with water-resistive barrier as follows:
 1. Cut back barrier 1/2 inch on each side of the break in supporting members at expansion-or control-joint locations.
 2. Apply barrier to cover vertical flashing with a minimum 4-inch overlap unless otherwise indicated.
- C. Building Wrap: Comply with manufacturer's written instructions and warranty requirements.

2.4 FLEXIBLE FLASHING INSTALLATION

- A. Apply flexible flashing where indicated to comply with manufacturer's written instructions.
 1. Prime substrates as recommended by flashing manufacturer.
 2. Lap seams and junctures with other materials at least 4 inches except that at flashing flanges of other construction, laps need not exceed flange width.
 3. Lap flashing over water-resistive barrier at bottom and sides of openings.
 4. Lap water-resistive barrier over flashing at heads of openings.
 5. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Polyethylene vapor retarders.
2. Reinforced-polyethylene vapor retarders.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for under-slab vapor retarders.
2. Section 072100 "Thermal Insulation" for vapor retarders integral with insulation products.

1.2 ACTION SUBMITTALS

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

1.3 INFORMATIONAL SUBMITTALS

- #### A. Product test reports.

PART 2 - PRODUCTS

2.1 POLYETHYLENE VAPOR RETARDERS

- #### A. Polyethylene Vapor Retarders: ASTM D4397, 6-mil- thick sheet, with maximum permeance rating of 0.1 perm.

PART 3 - EXECUTION

3.1 INSTALLATION OF VAPOR RETARDERS ON FRAMING

- #### A. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives, vapor retarder fasteners, or other anchorage system as recommended by manufacturer. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.
- #### B. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs and sealing with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Locate all joints over framing members or other solid substrates.

- C. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.
- D. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

3.2 INSTALLATION OF VAPOR RETARDERS IN CRAWL SPACES

- A. Install vapor retarders over prepared grade. Lap joints a minimum of 12 inches and seal with manufacturer's recommended tape. Install second layer over pathways to equipment.
- B. Extend vapor retarder over footings and seal to foundation wall or grade beam with manufacturer's recommended tape.
 - 1. Extend vapor retarder vertically minimum 16 inches above top of footing.
- C. Seal around penetrations such as utilities and columns in order to create a monolithic, airtight membrane at grade surface, perimeter, and all vertical penetrations.

END OF SECTION 072600

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Architectural roofing system of preformed steel panels (SHT MTL RFG 1).
- B. Wall panels
- C. Fastening system.
- D. Factory finishing.
- E. Accessories and miscellaneous components.
- F. Self-Adhered Sheet Waterproofing

1.2 RELATED REQUIREMENTS

- A. Section 079200 - Joint Sealants
- B. Section 076200 – Sheet Metal Flashing and Trim

1.3 REFERENCE STANDARDS

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2005.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2011.

1.4 PERFORMANCE REQUIREMENTS

- 1. Roof Panel:
 - A. General: Provide complete sheet metal roofing system, including, but not limited to, custom-fabricated metal roof pans, cleats, clips, anchors and fasteners, sheet metal flashing and drainage components related to sheet metal roofing, fascia panels, trim, underlayment, and accessories as indicated and as required for a weathertight installation.
 - B. Wind-Uplift Resistance: Provide custom-fabricated sheet metal roofing capable of resisting the following design negative uplift pressure. Provide clips, fasteners, and clip spacings of type indicated and with capability to sustain, without failure, a load equal to 3 times the design negative uplift pressure.
 - a. Wind Uplift Resistance: Design roofing system to resist wind uplift pressures when tested according to FM Approvals 4474, UL 580, or UL 1897, calculated based on project specific wind loads: 127 MPH (3 second gusts), Exposure C.
 - C. Thermal Movements: Provide sheet metal roofing that allows for thermal movements

resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal roofing thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss. Temperature Change (Range): 150 deg F, ambient; 180 deg F, material surfaces.

- D. Water Infiltration: Provide sheet metal roofing that does not allow water infiltration to building interior, with metal flashing and connections of sheet metal roofing lapped to allow moisture to run over and off the material.
2. Wall Panel:
- A. General Performance: Metal wall panel assemblies shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.
 - B. Delegated Design: Design metal wall panel assembly, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
 - C. Water Penetration under Dynamic Pressure: No evidence of water leakage when tested according to AAMA 501.1 under dynamic pressure equal to 20% of inward-acting, wind-load design pressure of not less than 6.24 lbf/sq. ft. (300 Pa) and not more than 12 lbf/sq. ft. (575 Pa.)
 - D. Structural Performance: Provide metal wall panel assemblies capable of withstanding the effects of the following loads and stresses within limits and under conditions indicate, based on testing according to ASTM E 1592:
 - a. Wind Loads: Determine loads based on the following minimum design wind pressures:
 - i. Uniform pressure of 30 lbf/sq. ft. (1436 Pa), acting inward or outward. Verify with Structural.
 - E. Thermal Movement: Accommodate thermal movement without buckling, joint opening, failure of connections, or other detrimental effects, through the following temperature changes:
 - a. 120 degrees F, ambient.
 - b. 180 degrees F, surface.

1.5 SUBMITTALS

- 1. Shop Drawings: Include layouts of roof panels, details of edge and penetration conditions, spacing and type of connections, flashings, underlayments, and special conditions.
 - a. Show work to be field-fabricated or field-assembled.

- b. Details for forming sheet metal roofing, including seams and dimensions.
 - c. Details for joining and securing sheet metal roofing, including layout of fasteners, clips, and other attachments. Include pattern of seams.
 - d. Details of termination points and assemblies, including fixed points.
 - e. Details of expansion joints, including showing direction of expansion and contraction.
 - f. Details of roof penetrations.
 - g. Details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counter flashings.
 - h. Details of special conditions.
 - i. Details of connections to adjoining work.
 - j. For Metal Wall Panels:
 - i. Indicate thickness and dimensions of parts, fastenings and anchoring methods, details and locations of joints, transitions and other provisions necessary for thermal expansion and contraction.
 - ii. Indicate locations of field- and factory-applied sealant.
 - k. Submit standard color samples for both roof and wall panels.
2. Coordination Drawings: Roof plans drawn to scale and coordinating penetrations and roof-mounted items. Show the following:
 - a. Sheet metal roofing and attachments.
 - b. Purlins and rafters if required.
 3. Shop drawing review coordination: Submit the following shop drawings at the same time:
 - a. Section 074113 - Metal Roof and Wall Panels
 - b. Section 076200 - Sheet Metal Flashing and Trim
 4. Verification Samples: For each roofing system specified, submit samples of minimum size 12 inches square, representing actual roofing metal, thickness, profile, color, and texture.
 - a. Include typical panel joint in sample.
 - b. Include typical fastening detail.
 5. Qualification Data: For installer and testing agency
 6. Warranty: Submit specified manufacturer's warranty and ensure that forms have been completed in Owner's name and are registered with manufacturer.

1.6 QUALITY ASSURANCE

1. Preinstallation Meeting: Before starting roofing construction, conduct meeting at Project site. Comply with requirements for preinstallation conferences.
 - A. Meet with Architect and Owner, sheet metal roofing Installer, wall panel Installer, metal deck Installer, and installers whose work interfaces with or affects sheet metal roofing including installers of roof accessories and roof-mounted equipment.
 - B. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - C. Review methods and procedures related to sheet metal roofing and wall panel installation.
 - D. Examine metal deck conditions for compliance with requirements, including flatness and attachment to structural members.
 - E. Review structural loading limitations of roof deck during and after roofing.
 - F. Review flashings, special roof details, roof drainage, roof penetrations, special siding details, equipment curbs, and condition of other construction that will affect sheet metal roofing and panels.
 - G. Review governing regulations and requirements for insurance, certificates, and testing and inspecting if applicable.
 - H. Review temporary protection requirements for sheet metal roofing during and after installation.
 - I. Review observation and repair procedures after sheet metal roofing and wall panel installation.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Provide strippable plastic protection on prefinished panels for removal after installation.
 1. Protect strippable protective covering on sheet metal from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal roofing installation.
- B. Store panels on project site as recommended by the manufacturer to minimize damage to panels prior to installation.

1.8 COORDINATION

- A. Coordinate sheet metal roofing and wall panels with rain drainage work, flashing, trim, and construction of parapets, walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.9 WARRANTY

1. Roof Panel:

- A. Special Watertightness Warranty: Manufacturer's standard form in which manufacturer agrees to replace sheet metal roofing and other components of the roofing system manufactured by them that fail to prevent the passage of water from the exterior to the interior within specified warranty period.
 - i. Watertightness Warranty Period: 20 years from the date of Substantial Completion.

 - B. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal roofing that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - i. 20-year Warranty for marine applications with a thick film primer and clear coat.
 - ii. Finish Warranty Period: 20 years from date of Substantial Completion.

 - C. Special Installer's Warranty: Roofing Installer's warranty, on Installer's standard warranty form, signed by Roofing Installer, in which Roofing Installer agrees to repair or replace components of custom-fabricated sheet metal roofing that fail in materials or workmanship within specified warranty period.
 - i. Failures include, but are not limited to, the following:
 - 1. Structural failures.
 - 2. Loose parts.
 - 3. Wrinkling or buckling.
 - 4. Failure to remain weather-tight, including water leakage.
 - 5. Deterioration of metals, metal finishes, and other materials beyond normal weathering, including non-uniformity of color or finish.
 - 6. Galvanic action between sheet metal roofing and dissimilar materials.
 - ii. Warranty Period: Two years from date of Substantial Completion.
2. Wall Panels:
- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal wall panel assemblies that fail in materials or workmanship within specified warranty period.
 - i. Failures include but are not limited to the following:
 - 1. Structural failures including rupturing, cracking, or puncturing.
 - 2. Deterioration of metals and other materials beyond normal weathering.
 - ii. Warranty Period: Two years from date of substantial completion.

 - B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal wall panels that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - i. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

1. Color fading more than 5 hunter units when tested according to ASTM D 2244.
 2. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 3. Crackling, checking, peeling, or failure of paint to adhere to bare metal.
- ii. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Metal Roof Panel: Design is based on Span Lok HP Low-Sloped Standing Seam Roof, manufactured by AEP Span for 4": 12" Slope.
1. Acceptable manufacturers are:
 - a. Fabral; www.fabral.com
 - b. Metal Sales: www.metalsales.com
 - c. Or approved equal.
- B. Metal Wall Panel: Design is based on Flex Series GS 1.2FX10-12, manufactured by AEP Span.
1. Acceptable manufacturers are:
 - a. Fabral; www.fabral.com
 - b. Metal Sales: www.metalsales.com
 - c. Or approved equal.

2.2 ARCHITECTURAL ROOF PANELS

- A. Performance Requirements: Provide complete engineered system complying with specified requirements and capable of remaining weather-tight while withstanding anticipated movement of substrate and thermally induced movement of roofing system.
- B. Metal Roofing: Factory-formed panels with factory-applied finish. Steel Thickness: 22 GA. Nominal uncoated thickness minimum 0.034 inch. Yield strength
1. PPG *Duramar XL Plus*, *Duramar XL ULTRA-Cool Plus*, Seacoast Dry Film Thickness, ASTM D 7091: 0.80 mil primer coat plus 0.80 mil color coat and 0.80 clear topcoat, 2.40 Mil total minimum thickness [three-coat system]
 2. Profile: Standing seam, with minimum 2.0 inch seam height; concealed fastener system for field seaming with special tool.
 3. Texture: Smooth.
 4. Width: Maximum panel coverage of 18 inches.
 5. Rib height of 2".
 6. Meet wind load criteria of 123 mph, ASCE Hazard Tool by Location. Roof fastener uplift pressure: 60 psf. Verify and coordinate with Structural.

2.3 ATTACHMENT SYSTEM

- A. Concealed System: Provide manufacturer's standard stainless steel concealed anchor clips

designed for specific roofing system and engineered to meet performance requirements, including anticipated thermal movement.

- B. Fasteners: Self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads.
 - 1. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
 - 2. Blind Fasteners: High-strength aluminum or stainless-steel rivets.

2.4 PANEL FINISH

- A. AEP Spans Duranar XL Plus Paint System for 20 year finish warranty or approved equal.

Fluoropolymer Coating System: Manufacturer's standard multi-coat thermocured coating system, including minimum 70 percent fluoropolymer color topcoat with minimum total dry film thickness of 1.5 mil complying with physical properties and coating performance requirements of AAMA 2605, except as modified below; color and gloss as indicated:

- 1. Humidity Resistance: 2000 hours.
- 2. Salt-Spray Resistance: 2000 hours.

- B. Color: Custom Color as selected by Architect.

2.5 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet (MEMB WP-3): 30 to 40 mils thick minimum, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
 - 1. Thermal Stability: Stable after testing at 240 deg. F; ASTM D 1970.
 - 2. Low Temperature Flexibility: Passes after testing at minus 20 deg. F; ASTM D 1970.
 - 3. Available Products:
 - a. Basis of Design for Roof Warranty AEP Span Underlayment HT.
 - e. Or approved equal.

2.6 ACCESSORIES AND MISCELLANEOUS ITEMS

- A. Miscellaneous Sheet Metal Items: Provide trim, moldings, closure strips, preformed crickets, caps, and equipment curbs of the same material, thickness, and finish as used for the roofing panels, unless otherwise noted. Items completely concealed after installation may optionally be made of stainless steel.
 - 1. Closures: Provide closures at eaves and ridges, fabricated of same metal as sheet metal roofing.
 - 2. Clips: Minimum 0.0625-inch- thick, stainless-steel panel clips designed to withstand negative-load requirements.
 - 3. Cleats: Mechanically seamed cleats formed from the following material:
 - a. Metallic-Coated Steel Roofing: 0.0250-inch- thick, stainless-steel or nylon-coated aluminum sheet.
 - 4. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 - 5. Closures: Closed-cell, expanded, cellular, rubber or cross-linked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or pre-molded to match sheet metal roofing profile. Provide closure strips where indicated or necessary to ensure weather-tight construction

- B. Flashing and Trim: Formed from 0.0179-inch- thick, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet pre-painted with coil coating. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent sheet metal roofing.
- C. Pipe Flashing: Pre-molded, EPDM pipe collar with flexible aluminum ring bonded to base.
- D. Pipe Style Snow Guard, basis of design Alpine Snowguards #ASG4025 Snow Guard or approved Equal for two rows of pipes as shown on plans. www.alpinesnowguards.com.
 - 1. Components as recommended by manufacturer
 - 2. Design requirements recommended by manufacturer and project structural criteria
- E. Rib and Ridge Closures: Provide prefabricated, close-fitting components of combination steel and closed-cell foam.
- F. Sealants: As specified in Section 07 90 05.
 - 1. Exposed sealant must cure to rubber-like consistency.
 - 2. Concealed sealant must be non-hardening type.
 - 3. Seam sealant must be factory-applied, non-skinning, non-drying type.
- G. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, non-sag, nontoxic, non-staining tape.
- H. Elastomeric Joint Sealant: ASTM C 920, of base polymer, type, grade, class, and use classifications required to produce joints in sheet metal roofing that will remain weathertight and as recommended by roll-formed sheet metal roofing manufacturer for installation indicated.
- I. Expansion-Joint Sealant: For hooked-type expansion joints, which must be free to move, provide non-setting, non-hardening, non-migrating, heavy-bodied polyisobutylene sealant.
- J. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.7 FABRICATION

- A. Panels: Fabricate panels and accessory items at factory, using manufacturer's standard processes as required to achieve specified appearance and performance requirements.
- B. Joints: Factory-install captive gaskets, sealants, or separator strips at panel joints to provide weathertight seals, eliminate metal-to-metal contact, and minimize noise from panel movements.
- C. General: Custom fabricate sheet metal roofing to comply with details shown and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions (pan width and seam height), geometry, metal thickness, and other characteristics of installation indicated. Fabricate sheet metal roofing and accessories at the shop to greatest extent possible.
 - 1. Standing-Seam Roofing: Form standing-seam pans with finished seam height of 1 inch.
- D. General: Fabricate roll-formed sheet metal roofing panels to comply with details shown and roll-formed sheet metal roofing manufacturer's written instructions.
- E. Fabricate sheet metal roofing to allow for expansion in running work sufficient to prevent leakage, damage, and deterioration of the Work. Form exposed sheet metal work to fit

substrates without excessive oil canning, buckling, and tool marks, true to line and levels indicated, and with exposed edges folded back to form hems.

1. Lay out sheet metal roofing so cross seams, when required, are made in direction of flow with higher pans overlapping lower pans. Stagger cross seams.
 2. Fold and cleat eaves and transverse seams in the shop.
 3. Form and fabricate sheets, seams, strips, cleats, valleys, ridges, edge treatments, integral flashings, and other components of metal roofing to profiles, patterns, and drainage arrangements shown and as required for leakproof construction.
- F. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant (concealed within joints).
- G. Sealant Joints: Where movable, nonexpansion-type joints are indicated or required to produce weathertight seams, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.
- H. Metal Protection: Where dissimilar metals will contact each other, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by manufacturers of dissimilar metals or by fabricator.
- I. Sheet Metal Accessories: Custom fabricate flashings and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated. Obtain field measurements for accurate fit before shop fabrication.
1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
 2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
 3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
 4. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
 5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
 6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
 - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" for application but not less than thickness of metal being secured.

2.8 ARCHITECTURAL WALL PANELS

- A. Performance Requirements: Provide complete engineered system complying with specified requirements and capable of remaining weather-tight while withstanding anticipated movement of substrate and thermally induced movement of roofing system.
- B. Metal Wall Panels: Factory-formed panels with factory-applied finish. Steel Thickness: 22 GA. Nominal uncoated thickness minimum 0.034 inch. Yield strength.

1. PPG *Duranar XL Plus*, *Duranar XL ULTRA-Cool Plus*, Seacoast Dry Film Thickness, ASTM D 7091: 0.80 mil primer coat plus 0.80 mil color coat and 0.80 clear topcoat, 2.40 Mil total minimum thickness [three-coat system]
2. Texture: Smooth.
3. Width: Maximum panel coverage of 18 inches.
4. Profile and Pattern: 2" consistent rib spacing (2" up / 2" down) - 1.2FX10-12 (1 ¼" rib height)
5. Meet wind load criteria – Wall panel fastener wind uplift pressure: 45 psf. verify and coordinate with Structural.

2.9 ATTACHMENT SYSTEM – METAL WALL PANELS

- A. Clip: Panel clip with pre-drilled holes attachment holes at one end and panel hook at other end, sized to fit panels.
 1. Product: AEP Span; Flex Series ½" Stand-Off Clip.
 2. Material: 18 gauge (.0438 Min.), 40ksi yield min., G90 galvanized, material in conformance with ASTM A-653 Class G90.
 3. Panel clips to be of proper design to resist uplift forces and reduce permanent deflection of panel assembly under design loads. Panel system manufacturer to provide proof that this has been addressed through use of clip strengthening ribs, short clip reach, or similar.
- B. Trims and Flashings: Material, metal thickness, and finish to match panels. Profiles indicated in Drawings.
- B. Color: Custom Color as selected by Architect.

2.8 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation of preformed metal roof and wall panels until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect and Owner of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Coordinate roofing work with provisions for roof drainage, flashing, trim, penetrations, and other adjoining work to assure that the completed roof will be free of leaks.
- B. Remove protective film from surface of panels immediately prior to installation. Strip film carefully, to avoid damage to prefinished surfaces.
- C. Separate dissimilar metals by applying a bituminous coating, self-adhering rubberized asphalt sheet, or other permanent method approved by roof panel manufacturer.
- D. Where metal will be in contact with wood or other absorbent material subject to wetting, seal joints with sealing compound and apply one coat of heavy-bodied bituminous paint.

3.3 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free, on roof sheathing under sheet metal roofing. Apply primer if required by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply over entire roof, in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days. Reference drawings for location along eave edge to 8'-0" in width up the roof slope to protect from ice-damming.

3.5 INSTALLATION

- A. Overall: Install roofing system in accordance with approved shop drawings and panel manufacturer's instructions and recommendations, as applicable to specific project conditions. Anchor all components of roofing system securely in place while allowing for thermal and structural movement.
 - 1. Install roofing system with concealed clips and fasteners, except as otherwise recommended by manufacturer for specific circumstances.
 - 2. Minimize field cutting of panels. Where field cutting is absolutely required, use methods that will not distort panel profiles. Use of torches for field cutting is absolutely prohibited.
- B. General: Anchor sheet metal roofing and other components of the Work securely in place, with provisions for thermal and structural movement. Install fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for a complete roofing system and as recommended by fabricator for sheet metal roofing.
 - 1. Field cutting of sheet metal roofing by torch is not permitted.
 - 2. Rigidly fasten eave end of sheet metal roofing and allow ridge end free movement due to thermal expansion and contraction. Predrill roofing.
 - 3. Provide metal closures at peaks rake edges and each side of ridge caps.
 - 4. Flash and seal sheet metal roofing with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws.
 - 5. Locate and space fastenings in uniform vertical and horizontal alignment.
 - 6. Install ridge caps as sheet metal roofing work proceeds.
 - 7. Stagger roofing splices and end laps to avoid a four-panel lap splice condition.
 - 8. Lap metal flashing over sheet metal roofing to allow moisture to run over and off the

material.

- C. Fasteners: Use fasteners of sizes that will not penetrate completely through substrate.
 - 1. Steel Roofing:
- D. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by fabricator of sheet metal roofing or manufacturers of dissimilar metals.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Fascia: Align bottom of sheet metal roofing and fasten with blind rivets, bolts, or self-tapping screws. Flash and seal sheet metal roofing with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.

3.6 CLEANING

- A. Clean exposed sheet metal work at completion of installation. Remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving the work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to the finish.

3.7 CUSTOM-FABRICATED SHEET METAL ROOFING AND WALL PANEL INSTALLATION

- A. Fabricate and install work with lines and corners of exposed units true and accurate. Form exposed faces flat and free of buckles, excessive waves, and avoidable tool marks, considering temper and reflectivity of metal. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant. Fold back sheet metal to form a hem on concealed side of exposed edges.
 - 1. Install cleats to hold sheet metal panels in position. Attach each cleat with two fasteners to prevent rotation.
 - 2. Nail cleats not more than 12 inches o.c. Bend tabs over nails.
- B. Seal joints as shown and as required for leak-proof construction. Provide low-slope transverse seams using cleats where backup of moisture may occur.
 - 1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg. F, set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg. F.
 - 2. Prepare joints and apply sealants to comply with requirements in Section 07 90 05 - Joint Sealers.
- C. Provide expansion cleats in roof panels that exceed 30 feet in length.
- D. Standing-Seam Roofing: Attach standing-seam metal pans to substrate with cleats, double-nailed at 12 inches o.c. Install pans reaching from eave to ridge before moving to adjacent pans. Lock each pan to pan below with transverse seam. Before pans are locked, apply continuous bead of sealant to top flange of lower pan. Crimp standing seams by folding over twice so cleat and pan edges are completely engaged.

3.8 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weather-tight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
 - 1. Install components required for a complete sheet metal roofing assembly including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
 - 1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
 - 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).
- C. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 4 feet o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.
- D. Pipe Flashing: Form flashing around pipe penetration and sheet metal roofing. Fasten and seal to sheet metal roofing as recommended by manufacturer.
- E. Remove temporary protective coverings and strippable films, if any, as sheet metal roofing is installed. On completion of sheet metal roofing installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.

END OF SECTION

SECTION 076200 - SHEET METAL FLASHING AND TRIM

1.1 SUBMITTALS

- A. Shop Drawings: Provide shop drawings indicating component material type and grade, material thickness, profile and coating type and thickness.

1.2 Related Requirements:

1. Section 077200 Roof Accessories
2. Section 074113 – Metal Roof Panels

1.3 QUALITY ASSURANCE

- A. Mockups: Of typical, installed hanging gutter.
 1. Accepted mock-up may remain as a part of the work.

1.4 PERFORMANCE REQUIREMENTS

- A. SPRI Wind Design Standard: For roof edge flashings according to ANSI/SPRI/FM 4435/ES-1 for project wind loads:
 1. Wind Loads: 123 mph ASCE Hazard Tool by Location. Verify and coordinate with Structural.

1.5 MATERIALS

- A. Metallic-Coated Steel Sheet:
 1. Gage per 1.5.A below.
 2. Hot dipped galvanized, G90, ASTM A123 / A123M-17 to match metal roof and wall panel coating system, Duranar XL Plus, or approved substitution.
 - a. Color as selected by Architect from manufacturer's standard range
 - b. To be coordinated with Metal Roof and Wall Panel Colors.

1.6 PRODUCTS

- A. Brake Formed Fabrications: Including but not limited to:
 1. Flashings and trims – 22g.
 2. Flashings with end dams – 22g.
 3. Cleats – Same gage as item supported.
 4. Pan flashings with end dams – 22g.
 5. Hanging gutters and gutter accessories – 18g.
 6. Conductor heads – 18g.
 7. Downspouts – 18g.
 8. Accessories.
 - a. Gutter straps – 18g.

- b. Downspout mounting straps and stirrups – 18g.
9. Exposed edges of brake formed assemblies intended to be exposed; finished edges and drip edges shall be hemmed. Do not hem edges at splice joints.

B. Miscellaneous Products:

1. Fasteners: Screws and rivets of 316 stainless steel.
2. Sealant:
 - a. Construction sealant: Dow 795, black.
 - b. Gutter sealant: Water cut-off mastic at lapped metal with EPDM sheet flashing overlaying full length of joint.
3. Splash Blocks: Pre-cast concrete, 12"W x 24"L x 4"D.

1.7 EXECUTION

A. Fabrication:

1. Fabricate flashings, gutters and downspouts in longest lengths possible, 10' sections minimum.
2. Field roll-formed fabrication acceptable if material gage and profile requirements can be met.

B. Installation:

1. Fastening, General:
 - a. Where fasteners used in the installation fabrications below penetrate water collection or conduction walls of the fabrications, fastener heads and tip penetrations shall be coated in water cut-off mastic or manufacturer's recommended sealant.
2. Flashings:
 - a. Install flashings in assemblies such that mounting legs are positively lapped by materials above, and so drainage leg is positively lapping material below.
 - b. At flashing splice joints, lap splicing members no less than 3" and seal with water cut-off mastic unless noted otherwise in drawings.
 - c. Anchor flashings using cleats and concealed (lapped by other assembly materials) fasteners wherever possible.
3. Gutters:
 - a. Install using integral, continuous mounting flange as indicated in drawings.
 - b. Gutter beds shall a minimum slope of 1/8" per foot towards downspouts and conductor heads except where impractical, gutter beds may be flat.
 - c. Back-sloped gutter beds are prohibited. Gutters with back-sloped beds shall be removed and reinstalled at Contractor's expense.
 - d. Install gutter straps as indicated in drawings.
 - e. Splice gutter sections as indicated in drawings.
4. Conductor Boxes:
 - a. Install conductor boxes as indicated in drawings, and to align with downspout storm drain inlets where occurring.
5. Downspouts:
 - a. Install downspouts as indicated in drawings:
 - b. Install in gutter beds using integral mounting flange, sealed to gutter bead with water cut-off mastic and mechanically fastened.
 - c. Mechanically fasten at conductor box outlets.

- d. Mechanically fasten to new and existing metal panels using downspout mounting brackets. Space brackets not more than 5' O.C.
- e. The intent of this document is to replace all existing downspouts, the majority of which connect to existing drains at grade, and to replace existing downspouts where indicated in drawings.
 - 1) Where storm inlets are available within 10' of replacement and new downspout locations, offset downspouts to route to and drain into inlets.
 - 2) Where storm inlets are not available within 10' of replacement or new downspout locations, daylight downspout, turning downspout outlet away from building, with minimum 8" outlet leg. Provide splash block.
 - 3) Insure that gutters have positive flow to downspouts
 - 4) Coordinate with Electrical for heat trace.

END OF SECTION 076200

SECTION 077200 - ROOF ACCESSORIES

1.1 SUBMITTALS

- A. Product Data: For all products provided under this section.
- B. Shop Drawings: Project specific drawings detailing how products provided will be installed within the roofing system including anchorage and flashing details.
- C. Delegated Design for roof mounted products under this section:
 - 1. Design shall include system manufacturer's recommended system layout utilizing Architect's plan drawings, identifying and dimensionally locating all system components.
 - 2. Indicating load rating and required anchorage to meet load rating with substantiating calculations.
 - 3. Design shall utilize architect's drawings to identify existing substrates and structure to which roof mounted products will be attached.
- D. Certifications and Approvals: For fall protection products requiring regulatory approval for use.

1.2 Related Requirements:

- 1. Section 077200 Roof Accessories
- 2. Section 076200 – Sheet Metal Flashing and Trim
- 3. Electrical Drawings Sheet E2.1 for Heat Trace Design

1.3 PRODUCTS

- A. Snow Guard Systems: Provide pre-engineered snow guard systems:
 - 1. Basis of Design: Alpine PP115
 - a. Or approved substitute.
 - 2. Type: (2) Tube snow fence with deck mount brackets.
 - 3. Material:
 - a. Brackets: Stainless steel.
 - b. Tube fencing: Aluminum, mill finish.
 - 4. Accessory products and fasteners: As provided by manufacturer.
- B. Heat Trace Systems: Provide heat trace system:
 - 1. Basis of Design:
 - a. Trace: EasyHeat SR Trace cable SR51J
 - b. Thermostat: Nelson Heat Systems TA4X140
 - c. Or approved substitute.
 - 2. Accessory products and fasteners: All electrical material required for the complete installation and operation of the heat trace system including but not limited to:
 - a. Breakers
 - b. Conductors

- c. Conduit
 - d. Weather-tight junction boxes
 - e. Wire and conduit restraints and supports
 - f. Firestopping materials
3. Reference Electrical for coordination further information

1.4 EXECUTION

A. Snow Guard Systems:

1. Install snow guard systems in conformance with manufacturer's instructions using only manufacturer's provided components.
2. Fully flash snow guard system components penetrating roof membrane using roof membrane manufacturer's standard, pre-formed penetration flashing components.

B. Heat Trace Systems:

1. Contractor shall be responsible for field measuring to determine length of heat trace required for project.
 - a. Reference Electrical Drawings sheet E2.1 for design and layout.
2. Submit product data and operation manual to owner upon completion of work.

END OF SECTION 077200

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Nonstaining silicone joint sealants.
 2. Mildew-resistant joint sealants.

1.2 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.
- B. Joint-Sealant Schedule: Include the following information:
1. Joint-sealant application, joint location, and designation.
 2. Joint-sealant manufacturer and product name.
 3. Joint-sealant color.

1.3 INFORMATIONAL SUBMITTALS

- A. Sample warranties.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C1021 to conduct the testing indicated.

1.5 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

- A. VOC Content: Verify sealants and sealant primers comply with the following:
1. Architectural sealants have a VOC content of 250 g/L or less.
 2. Sealants and sealant primers for nonporous substrates have a VOC content of 250 g/L or less.
 3. Sealants and sealant primers for porous substrates have a VOC content of 775 g/L or less.
 4. Verify sealant complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 NONSTAINING SILICONE JOINT SEALANTS

- A. Non-staining Joint Sealant: No staining of substrates when tested according to ASTM C1248.
1. Basis of Design Manufacturer: Dow Chemical Corporation.
 2. Basis of Design Product: Dowsil 795.
 3. Substitutes: Any product meeting or exceeding the material physical, performance, aesthetic, sustainability, and warranty criteria of the Basis of Design product and indicated herein. See Section 012500 Substitution Procedures.
 4. Sealant: 1-part neutral cure silicone sealant.
 - a. Tension adhesion strength:
 - 1) At 25% Extension: 45psi ASTM C 1135.
 - 2) At 50% Extension: 60psi ASTM C 1135.
 - b. Joint movement capability: +/-50 ASTM C719.
 - c. Urea Formaldehyde: None.
 - d. VOC content: 30 g/L SCAQMD Rule 1168.
 5. Use: Building exterior and building interior at all secondary opening sealant joints at windows and doors.

2.3 MILDEW-RESISTANT JOINT SEALANTS

- A. Mildew-Resistant Joint Sealant formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.
1. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.
 2. Use: For interior use in wet areas
- B. Mildew-Resistant Joint Sealant formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.
1. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.

2. Use: For interior use in dry areas

C. Fully curing acoustical sealant.

1. Minimum 25% elongation capacity after curing.
2. Paintable.
3. Use: For application at all joints and penetrations occurring in and around interior gypsum board assemblies

2.4 JOINT-SEALANT BACKING

- A. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin), or any type, as approved in writing by joint-sealant manufacturer for joint application indicated and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- B. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer.

2.5 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
1. Remove laitance and form-release agents from concrete.
 2. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces.

3.2 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with ASTM C1193 and joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
- C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 1. Provide concave joint profile per Figure 8A in ASTM C1193 unless otherwise indicated.

3.3 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
 - 1. Extent of Testing: Test completed and cured sealant joints as follows:
 - a. Perform **10** tests for the first 1000 feet (300 m) of joint length for each kind of sealant and joint substrate.
 - b. Perform one test for each 1000 feet (300 m) of joint length thereafter or one test per each floor per elevation.
 - 2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.
- B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

END OF SECTION 079200

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Interior standard steel doors and frames.
- B. Exterior standard steel doors and frames.

1.2 RELATED REQUIREMENTS

- A. Section 072100 - Thermal Insulation
- C. Section 087100 - Door Hardware.
- E. Section 092116 - Gypsum Board Assemblies
- G. Section 099000 - Painting and Coating

1.3 REFERENCE STANDARDS

- A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2009.
- B. ANSI A250 - Test Procedure and Acceptance Criteria for - Physical Endurance for Steel Doors and Hardware Reinforcings; current edition.
- C. ANSI A250.8 - SDI-100 Recommended Specifications for Standard Steel Doors and Frames; 2003.
- D. ANSI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 1998 (R2011).
- E. ASTM A 153/ A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware-AASHTO No.: M232; current edition.
- F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2011.
- G. ASTM A 780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; current edition.
- H. ASTM A 1011 - A 1011M REV B - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High- Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; current edition.
- I. ASTM A 1008 - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; current edition.

- J. ASTM C1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus; 2011.
- K. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009.
- L. ASTM E413 - Classification for Rating Sound Insulation; 2010.
- M. ASTM E1408 - Standard Test Method for Laboratory Measurement of the Sound Transmission Loss of Door Panels and Door Systems; 1991 (Reapproved 2000).
- N. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2000.
- O. SSPC-Paint 20 - Zinc-Rich Coating Type I Inorganic and Type II Organic; current edition.
- P. SSPC-SP 1 - Solvent Cleaning; current edition.
- Q. SSPC-SP 3 - Power Tool Cleaning; current edition.
- R. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; The National Association of Architectural Metal Manufacturers; 2007.
- S. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2013.
- T. DHI A115 - Preparation of Mortise Locks in 1-3/8 in and 1-3/4 in Standard Steel Doors and Frames; current edition.
- U. NFPA 105 - Preparation of Mortise Locks in 1-3/8 in and 1-3/4 in Standard Steel Doors and Frames; current edition.
- V. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.
- W. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
- X. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

1.4 DEFINITIONS

- A. Uncoated steel sheet thickness is indicated as the minimum thickness according to HMMA 803, Steel Tables.
- B. Metallic-coated steel sheet thickness is indicated as the minimum thickness of the uncoated base metal.

1.5 PERFORMANCE REQUIREMENTS

- A. Thermally Rated Door Assemblies: Provide door assemblies with U-factor of not more than 0.50 deg Btu/F x h x sq. ft. when tested in accordance with ASTM C518.

1.6 SUBMITTALS

- A. Product Data: Materials and details of design and construction, sound and fire resistance ratings, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes for each door specified; and one copy of referenced grade standard.
- B. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.
- C. Door Schedule: Submit schedule of doors and frames using same reference numbers for details and openings as those on Drawings.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained for commercial installations and approved by manufacturer.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented commercial experience.
- C. Maintain at the project site a copy of all reference standards dealing with installation.
- D. Comply with applicable SDI standards for welded steel doors and frames for standards not listed otherwise in this section.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Store in accordance with NAAMM HMMA 840.
- B. Deliver doors and frames palleted, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.
- C. Inspect doors and frames, on delivery, for damage. Minor damage may be repaired provided refinished items match new work and are approved by Architect; otherwise, remove and replace damaged items as directed.
- D. Store doors and frames under cover at building site. Place units on minimum 4-inch- high wood blocking. Avoid using non-vented plastic or canvas shelters that could create a humidity chamber. If wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch spaces between stacked doors to permit air circulation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Steel Doors and Frames: Basis-of-Design: TruDoor Commercial Doors
 - 1. PERFORMANCE REQUIREMENTS : Thermally Rated Door Assemblies: Provide door assemblies with U-factor of not more than 0.50 deg Btu/F x h x sq. ft. when tested in accordance with ASTM C518.

2.2 EXTERIOR STANDARD STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 2; ANSI/SDI A250.4, Level B..

1. Doors:

- a. Type: As indicated in the Door and Frame Schedule.
- b. Thickness: 1-3/4 inches.
- c. Face: Metallic-coated steel sheet, minimum thickness of 0.042 inch, with minimum Hot-dipped Galvanized A60 coating.
- d. Edge Construction: Model 1, Full Flush.
- e. Edge Bevel: Provide manufacturer's standard beveled or square edges.
- f. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
- g. Bottom Edges: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
- h. Core: Polystyrene.

2. Frames:

- a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum Hot-dipped galvanized A60 coating.
- b. Construction: Full profile welded.
- c. Finish: Factory Primed.

2.3 FRAME ANCHORS

A. Jamb Anchors:

- 1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
- 2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet.
- 3. Post-installed Expansion Anchor: Minimum 3/8-inch- diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.

B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.

- C. Floor Anchors for Concrete Slabs with Underlayment: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at top of underlayment.

- D. Material: ASTMA879/A879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
 - 1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M; hot-dip galvanized in accordance with ASTM A153/A153M, Class B.

2.4 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B.
- D. Inserts, Bolts, and Fasteners: Hot-dip galvanized in accordance with ASTM A153/A153M.
- E. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- F. Mineral-Fiber Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-

2.5 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117 ANSI/NAAMM-HMMA 861.
- C. Hollow Metal Doors:
 - 1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
 - 2. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 - 1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 - 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 4. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 - 5. Jamb Anchors: Provide number and spacing of anchors as follows:

- a. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - 5) Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.
6. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.
- F. Thermal-Rated (Insulating) Assemblies: At exterior locations and elsewhere as shown or scheduled, provide doors and frames fabricated as thermal-insulating assemblies and tested according to ASTM C 236 or ASTM C 976 or ASTM C 1363.
 1. Provide thermal-rated assemblies with U-factor of 0.23 Btu/sq. ft. x h x deg F, unless otherwise indicated.
 - a. Provide thermal-rated assemblies with R-factor of 5.
- G. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
 1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8
 2. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
 3. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.6 FINISH MATERIALS

- A. Primer: Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:
 - 1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - 2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - 3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - 4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.
- C. Drill and tap doors and frames to receive non-templated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Install in accordance with the requirements of the specified door grade standard ANSI/SDI 250.11.
- C. In addition, install fire rated units in accordance with NFPA 80.
- D. Coordinate frame anchor placement with wall construction.
- E. Where frames are aligned along a given horizontal data like, as noted but not limited to, wood paneling, joints or horizontal trim, align all top of frames. Coordinate installation of hardware.

- F. Coordinate installation of glazing.
- G. Frames:
 - 1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - b. Install frames with removable glazing stops located on secure side of opening.
 - c. Install door silencers in frames before grouting.
 - d. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - e. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - f. Fill all exterior steel frames with insulation
 - 2. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
 - 3. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch , measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch , measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch , measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch , measured at jambs at floor.
 - 4. Set all exterior thresholds in Sealant. (THRESHOLD, SET IN SEALANT)
- H. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
 - 1. Non-Fire-Rated Standard Steel Doors:
 - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch .
 - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch .
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch .

d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch

J. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner

3.4 ADJUSTING

- A. Adjust for smooth and balanced door movement.
- B. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- C. Remove grout and other bonding material from hollow metal work immediately after installation.
- D. Prime-Coat Touchup: Immediately after erection, sand smooth all areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- E. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
- F. Adjust sound control doors so that seals are fully engaged when door is closed.

END OF SECTION 081113

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes access doors and frames for walls and ceilings.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each type of access door and frame and for each finish specified, complete assembly minimum 6 by 6 inches in size.

1.3 INFORMATIONAL SUBMITTALS

- A. Provide manufacturer's standard warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Manufacturer's Installation Instructions and Operation & Maintenance: Indicate installation, operation and maintenance requirements and rough-in dimensions.

1.5 QUALITY ASSURANCE

- A. Specify single source supplier for consistent appearance throughout the building.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site ready use.
- B. Exercise proper care in handling of Work so as not to disrupt finished surfaces.
- C. Store materials under cover in a dry and clean location off the ground.

1.7 WARRANTY

- A. Provide manufacturer's standard warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis- of – Design manufacturer: Nystrom Products or approved equal.

2.2 STANDARD (NON-RATED) ACCESS DOORS AND FRAMES

A. Flush Access Doors Non-Rated General Purpose Access Door

1. Description: Face of door flush with frame, with drywall bead.
2. Locations: Ceiling.
3. Door Size: 20"x30".
4. Steel Sheet:
 - a. Door Material: 16 gauge. Fold on all four sides for structural rigidity.
 - b. Frame Material: 16 gauge. Provide 1/4-inch mounting holes and easy install tabs.
 - c. Finish: Paintable White; powder-coat.
5. Latch and Lock: Cam latch, screwdriver operated.
6. Options: Flush continuous piano hinge.

2.3 FABRICATION

- A. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- B. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.

2.4 FINISHES

- A. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
1. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

2. Factory Finished: Apply manufacturer's standard baked-enamel or powder-coat finish immediately after cleaning and pretreating, with minimum dry-film thickness of 1 mil for topcoat.
3. Color: As selected by Architect from full range of industry colors

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION

SECTION 085313 - VINYL WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes vinyl-framed windows.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for vinyl windows.
- B. Shop Drawings: For vinyl windows.
 - 1. Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.
- C. Product Schedule: For vinyl windows. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and Installer.
- B. Product Test Reports: For each type of vinyl window, for tests performed by a qualified testing agency.
- C. Sample Warranties: For manufacturer's warranties.

1.4 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace vinyl windows that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure to meet performance requirements.
 - b. Structural failures including excessive deflection, water leakage, and air infiltration.
 - c. Faulty operation of movable sash and hardware.
 - d. Deterioration of materials and finishes beyond normal weathering.
 - e. Failure of insulating glass.
 - 2. Warranty Period:

- a. Window: 10 years from date of Substantial Completion.
- b. Glazing Units: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain vinyl windows from single source from single manufacturer.
- B. Basis of Design: Milgard "Trinsic Series" or approved equal

2.2 WINDOW PERFORMANCE REQUIREMENTS

- A. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:
 1. Minimum Performance Class: LC.
 2. Minimum Performance Grade: 25.
- B. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.30 Btu/sq. ft. x h x deg F.

2.3 VINYL WINDOWS

- A. Operating Types: Provide the following operating types in locations indicated on Drawings:
 1. Horizontal Slider.
 2. Vented.
 3. Double-pane, Low E Base Bid.
 4. Color Black
- B. Frames and Sashes: Impact-resistant, UV-stabilized PVC complying with AAMA/WDMA/CSA 101/I.S.2/A440.
 1. Finish: Integral color, to be selected from manufacturers full line.
- C. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal and meets requirements. Glazing to be double pane, low-e.
- D. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.
- E. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.
- F. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.

1. Exposed Fasteners: Do not use exposed fasteners to greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

2.4 INSECT SCREENS

- A. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.

2.5 FABRICATION

- A. Fabricate vinyl windows in sizes indicated. Include a complete system for installing and anchoring windows.
- B. Glaze vinyl windows in the factory.
- C. Weather strip each operable sash to provide weathertight installation.
- D. Mullions: Provide mullions and cover plates, compatible with window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections. Provide mullions and cover plates capable of withstanding design wind loads of window units. Provide manufacturer's standard finish to match window units.
- E. Hardware: Mount hardware through double walls of vinyl extrusions or provide corrosion-resistant reinforcement.
- F. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation. Allow for scribing, trimming, and fitting at Project site.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.
- C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.
- B. Install windows level, plumb, square, true to line, without distortion, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.

3.3 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.
- B. Clean exposed surfaces immediately after installing windows. Remove excess sealants, glazing materials, dirt, and other substances.
 - 1. Keep protective films and coverings in place until final cleaning.
- C. Remove and replace sashes if glass has been broken, chipped, cracked, abraded, or damaged during construction period.
- D. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

END OF SECTION 085313

PART 1 - GENERAL

1.1 SUMMARY:

- A. Section Includes: Finish Hardware for door openings, except as otherwise specified herein.
 - 1. Door hardware for swinging doors.
 - 2. Keyed cylinders as indicated.
- B. RELATED SECTIONS:
 - 1. Division 8: Hollow Metal Doors and Frames.
- C. DOOR HARDWARE TYPES
 - 1. Pivot sets and intermediate pivots.
 - 2. Hinges.
 - 3. Lock cylinders.
 - 4. Keys, keying, and key control.
 - 5. Locksets, latchsets, and privacy sets.
 - 6. Exit devices.
 - 7. Closers.
 - 8. Mullions.
 - 9. Overhead, wall, and floor stops.
 - 10. Protection plates.
 - 11. Gasketing for exterior and interior doors, as required.
 - 12. Door holders.
 - 13. Door bottoms.
 - 14. Thresholds.
 - 15. Silencers.
- D. REFERENCES:
 - 1. Comply with applicable requirements of the following standards. Where these standards conflict with other specific requirements, the most restrictive shall govern.
 - a. Builders Hardware Manufacturing Association (BHMA)
 - b. ADA – Americans with Disabilities Act of 1900 including Accessibility Guidelines.
 - c. NFPA 101 Life Safety Code
 - d. ANSI-A117.1 – Accessible and Usable Buildings and Facilities
 - e. DHI /ANSI A115.IG – Installation Guide for Doors and Hardware
 - f. ICC – International Building Code

E. INTENT OF HARDWARE GROUPS

1. Should items of hardware not definitely specified be required for completion of the Work, furnish such items of type and quality comparable to adjacent hardware and appropriate for service required.
2. Where items of hardware aren't correctly specified, are required for completion of the Work, a written statement of such omission, error, or other discrepancy to be submitted to Architect, prior to date specified for receipt of bids for clarification by addendum; or furnish such items in the type and quality established by this specification, and appropriate to the service intended.

1.2 SUBSTITUTIONS:

- A. Comply with Division 1.

1.3 SUBMITTALS:

- A. Comply with Division 1.

- B. Special Submittal Requirements: Combine submittals of this Section with Sections listed below to ensure the "design intent" of the system/assembly is understood and can be reviewed together.

- C. Product Data: Manufacturer's specifications and technical data including the following:

1. Detailed specification of construction and fabrication.
2. Manufacturer's installation instructions.
3. Wiring diagrams for each electric product specified. Coordinate voltage with electrical before submitting.
4. Submit 6 copies of catalog cuts with hardware schedule.
5. Provide 9001-Quality Management and 14001-Environmental Management for products listed in Materials Section 2.2

- D. Shop Drawings - Hardware Schedule: Submit 6 complete reproducible copy of detailed hardware schedule in a vertical format.

1. List groups and suffixes in proper sequence.
2. Completely describe door and list architectural door number.
3. Manufacturer, product name, and catalog number.
4. Function, type, and style.
5. Size and finish of each item.
6. Mounting heights.
7. Explanation of abbreviations and symbols used within schedule.
8. Detailed wiring diagrams, specially developed for each opening, indicating all electric hardware, security equipment and access control equipment, and door and frame rough-ins required for specific opening.

- E. Templates: Submit templates and "reviewed Hardware Schedule" to door and frame supplier and others as applicable to enable proper and accurate sizing and locations of cutouts and reinforcing.

1. Templates, wiring diagrams and "reviewed Hardware Schedule" of electrical terms to electrical for coordination and verification of voltages and locations.
- F. Samples: (If requested by the Architect)
1. 1 sample of Lever and Rose/Escutcheon design, (pair).
 2. 3 samples of metal finishes
- G. Contract Closeout Submittals: Comply with Division 1 including specific requirements indicated.
1. Operating and maintenance manuals: Submit 3 sets containing the following.
 - a. Complete information in care, maintenance, and adjustment, and data on repair and replacement parts, and information on preservation of finishes.
 - b. Catalog pages for each product.
 - c. Name, address, and phone number of local representative for each manufacturer.
 - d. Parts list for each product.
 2. Copy of final hardware schedule, edited to reflect, "As installed".
 3. Copy of final keying schedule
 4. As installed "Wiring Diagrams" for each piece of hardware connected to power, both low voltage and 110 volts.
 5. One set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.
- 1.4 QUALITY ASSURANCE
- A. Comply with Division 1.
1. Statement of qualification for distributor and installers.
 2. Statement of compliance with regulatory requirements and single source responsibility.
 3. Distributor's Qualifications: Firm with 3 years experience in the distribution of commercial hardware.
 - a. Distributor to employ full time Architectural Hardware Consultants (AHC) for the purpose of scheduling and coordinating hardware and establishing keying schedule.
 - b. Hardware Schedule shall be prepared and signed by an AHC.
 4. Installer's Qualifications: Firm with 3 years experienced in installation of similar hardware to that required for this Project, including specific requirements indicated.
 5. Regulatory Label Requirements: Provide testing agency label or stamp on hardware for labeled openings.
 - a. Provide UL listed hardware for labeled and 20 minute openings in conformance with requirements for class of opening scheduled.
 - b. Underwriters Laboratories requirements have precedence over this specification where conflict exists.
 6. Single Source Responsibility: Except where specified in hardware schedule, furnish products of only one manufacturer for each type of hardware.

- B. Review Project for extent of finish hardware required to complete the Work. Where there is a conflict between these Specifications and the existing hardware, notify the Architect in writing and furnish hardware in compliance with the Specification unless otherwise directed in writing by the Architect.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Packing and Shipping: Comply with Division 1.
 - 1. Deliver products in original unopened packaging with legible manufacturer's identification.
 - 2. Package hardware to prevent damage during transit and storage.
 - 3. Mark hardware to correspond with "reviewed hardware schedule".
 - 4. Deliver hardware to door and frame manufacturer upon request.
- B. Storage and Protection: Comply with manufacturer's recommendations.

1.6 PROJECT CONDITIONS:

- A. Coordinate hardware with other work. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated, as necessary for the proper installation and function, regardless of omissions or conflicts in the information on the Contract Documents.
- B. Review Shop Drawings for doors and entrances to confirm that adequate provisions will be made for the proper installation of hardware.

1.7 WARRANTY:

- A. Refer to Conditions of the Contract
- B. Manufacturer's Warranty:
 - 1. Closers: Lifetime
 - 2. Locksets & Cylinders: Seven years
 - 3. All other Hardware: Two years.

1.8 OWNER'S INSTRUCTION:

- A. Instruct Owner's personnel in operation and maintenance of hardware units.

1.9 MAINTENANCE:

- A. Extra Service Materials: Deliver to Owner extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Division 1 Closeout Submittals Section.
 - 1. Special Tools: Provide special wrenches and tools applicable to each different or special hardware component.
 - 2. Maintenance Tools: Provide maintenance tools and accessories supplied by hardware component manufacturer.

3. Delivery, Storage and Protection: Comply with Owner's requirements for delivery, storage and protection of extra service materials.
- B. Maintenance Service: Submit for Owner's consideration maintenance service agreement for electronic products installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. The following manufacturers are approved subject to compliance with requirements of the Contract Documents. Approval of manufacturers other than those listed shall be in accordance with Division 1.

<u>Item:</u>	<u>Manufacturer:</u>	<u>Approved:</u>
Hinges	Stanley	Bommer, McKinney
Locksets	Best	Schlage ND Series
Cylinders	Best	
Exit Devices	Precision	Von Duprin,
Closers	Stanley	LCN 1460, Sargent 1430
Door Stops	Trimco	Burns, Rockwood
Threshold & Gasketing	National Guard	Reese, K.N. Crowder

- B. Hinges: Shall be Five Knuckle Ball bearing hinges – Satin Stainless Steel
1. Template screw hole locations
 2. Bearings are to be fully hardened.
 3. Bearing shell is to be consistent shape with barrel.
 4. Minimum of 2 permanently lubricated non-detachable bearings on standard weight hinge and 4 permanently lubricated bearing on heavy weight hinges.
 5. Equip with easily seated, non-rising pins.
 6. Non-Removable Pin screws shall be slotted stainless steel screws.
 7. Hinges shall be full polished, front, back and barrel.
 8. Hinge pin is to be fully plated.
 9. Bearing assembly is to be installed after plating.
 10. Sufficient size to allow 180-degree swing of door
 11. Furnish five knuckles with flush ball bearings
 12. Provide hinge type as listed in schedule.
 13. Furnish 3 hinges per leaf to 7 foot 6 inch height. Add one for each additional 30 inches in height or fraction thereof.
 14. Tested and approved by BHMA for all applicable ANSI Standards for type, size, function and finish
 15. UL10C listed for Fire rated doors.
- C. Cylindrical Type Locks and Latchsets:
1. Tested and approved by BHMA for ANSI A156.2, Series 4000, Operational Grade 1, Extra-Heavy Duty, and be UL10C listed.

2. Provide 9001-Quality Management and 14001-Environmental Management.
3. Fit modified ANSI A115.2 door preparation.
4. Locksets and cores to be of the same manufacturer to maintain complete lockset warranty
5. Locksets to have anti-rotational studs that are thru-bolted
6. Keyed lever shall not have exposed "keeper" hole
7. Each lever to have independent spring mechanism controlling it
8. 2-3/4 inch (70 mm) backset
9. 9/16 inch (14 mm) throw latchbolt
10. Provide sufficient curved strike lip to protect door trim
11. Outside lever sleeve to be seamless, of one-piece construction made of a hardened steel alloy
12. Keyed lever to be removable only after core is removed, by authorized control key
13. Provide locksets with 7-pin removable and interchangeable core cylinders
14. Hub, side plate, shrouded rose, locking pin to be a one-piece casting with a shrouded locking lug.
15. Locksets outside locked lever must withstand minimum 1400 inch pounds of torque. In excess of that, a replaceable part will shear. Key from outside and inside lever will still operate lockset.
16. Core face must be the same finish as the lockset.
17. Functions and design as indicated in the hardware groups.

D. Door Closers shall:

1. Tested and approved by BHMA for ANSI 156.4, Grade 1
2. UL10C certified
3. Provide 9001-Quality Management and 14001-Environmental Management.
4. Closer shall have extra-duty arms and knuckles
5. Conform to ANSI 117.1
6. Maximum 2 7/16 inch case projection with non-ferrous cover
7. Separate adjusting valves for closing and latching speed, and backcheck
8. Provide adapter plates, shim spacers and blade stop spacers as required by frame and door conditions
9. Full rack and pinion type closer with 1½" minimum bore
10. Mount closers on non-public side of door, unless otherwise noted in specification
11. Closers shall be non-handed, non-sized and multi-sized.
12. Finish shall be stainless steel.

E. Door Stops: Provide a dome floor or wall stop for every opening as listed in the hardware sets.

1. Wall stop and floor stop shall be stainless steel.
2. Provide fastener suitable for wall construction.
3. Coordinate reinforcement of walls where wall stop is specified.
4. Provide dome stops where wall stops are not practical. Provide spacers or carpet riser for floor conditions encountered

F. Seals: All seals shall be finished to match adjacent frame color. Seals shall be furnished as listed in schedule. Material shall be UL listed for labeled openings.

- G. Weatherstripping: Provide at head and jambs only those units where resilient or flexible seal strip is easily replaceable. Where bar-type weatherstrip is used with parallel arm mounted closers install weatherstrip first.
 - 1. Weatherstrip shall be resilient seal of (Neoprene, Polyurethane, Vinyl, Pile, Nylon Brush, Silicone)
 - 2. UL10C Positive Pressure rated seal set when required.
- H. Door Bottoms/Sweeps: Surface mounted or concealed door bottom where listed in the hardware sets.
 - 1. Door seal shall be resilient seal of (Neoprene, Polyurethane, Nylon Brush, Silicone)
 - 2. UL10C Positive Pressure rated seal set when required.
- I. Thresholds: Thresholds shall be aluminum beveled type with maximum height of ½” for conformance with ADA requirements. Furnish as specified and per details. Provide fasteners and screws suitable for floor conditions.
- J. Silencers: Furnish silencers on all interior frames, 3 for single doors, 2 for pairs. Omit where any type of seals occur.
- K. Standalone Electronic lock: Basis of Design to be Schlage CO-100 or approved equal by owner. Contractor to submit bid based on CO-100 CY40 KP ATH 626 S123 (RH/LH)09-663 10-072 134 with review and verification from Architect and Owner. (RH/LH) handing to be determined based on individual door to be coordinated in submittal for review.

2.2 FINISH:

- A. Designations used in Schedule of Finish Hardware - 3.05, and elsewhere to indicate hardware finishes are those listed in ANSI/BHMA A156.18 including coordination with traditional U.S. finishes shown by certain manufacturers for their products.
- B. Powder coat door closers to match other hardware, unless otherwise noted.
- C. Aluminum items shall be finished to match predominant adjacent material. Seals to coordinate with frame color.

2.3 KEYS AND KEYING:

- A. Provide keyed brass construction cores and keys during the construction period. Construction control and operating keys and core shall not be part of the Owner's permanent keying system or furnished in the same keyway (or key section) as the Owner's permanent keying system. Permanent cores and keys (prepared according to the accepted keying schedule) will be furnished to the Owner.
- B. Cylinders, removable and interchangeable core system: Best Patented 7-pin.

- C. Permanent keys and cores: Stamped with the applicable key mark for identification. These visual key control marks or codes will not include the actual key cuts. Permanent keys will also be stamped "Do Not Duplicate."
- D. Transmit Grand Masterkeys, Masterkeys and other Security keys to Owner by Registered Mail, return receipt requested.
- E. Furnish keys in the following quantities:
 - 1. 1 each Grand Masterkeys
 - 2. 4 each Masterkeys
 - 3. 2 each Change keys each keyed core
 - 4. 15 each Construction masterkeys
 - 5. 1 each Control keys
- F. The Owner, or the Owner's agent, will install permanent cores and return the construction cores to the Hardware Supplier. Construction cores and keys remain the property of the Hardware Supplier.
- G. Keying Schedule: Arrange for a keying meeting, and programming meeting with Architect Owner and hardware supplier, and other involved parties to ensure locksets and locking hardware, are functionally correct and keying and programming complies with project requirements. Furnish 3 typed copies of keying and programming schedule to Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of conditions: Examine doors, frames, related items and conditions under which Work is to be performed and identify conditions detrimental to proper and or timely completion.
 - 1. Do not proceed until unsatisfactory conditions have been corrected.

3.2 HARDWARE LOCATIONS:

- A. Mount hardware units at heights indicated in the following publications except as specifically indicated or required to comply with the governing regulations.
 - 1. Recommended Locations for Builder's Hardware for Standard Steel Doors and Frames, by the Door and Hardware Institute (DHI).
 - 2. Recommended locations for Architectural Hardware for flush wood doors (DHI).
 - 3. WDMA Industry Standard I.S.-1A-04, Industry Standard for Architectural wood flush doors.

3.3 INSTALLATION:

- A. Install each hardware item per manufacturer's instructions and recommendations. Do not install surface mounted items until finishes have been completed on the substrate. Set units level, plumb

and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

- B. Conform to local governing agency security ordinance.
- C. Install Conforming to ICC/ANSI A117.1 Accessible and Usable Building and Facilities.
 - 1. Adjust door closer sweep periods so that from the open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the landing side of the door.
- D. Installed hardware using the manufacturers fasteners provided. Drill and tap all screw holes located in metallic materials. Do not use “Riv-Nuts” or similar products.

3.4 FIELD QUALITY CONTROL AND FINAL ADJUSTMENT

- A. Contractor/Installers, Field Services: After installation is complete, contractor shall inspect the completed door openings on site to verify installation of hardware is complete and properly adjusted, in accordance with both the Contract Documents and final shop drawings.
 - 1. Check and adjust closers to ensure proper operation.
 - 2. Check latchset, lockset, and exit devices are properly installed and adjusted to ensure proper operation.
 - a. Verify levers are free from binding.
 - b. Ensure latchbolts and dead bolts are engaged into strike and hardware is functioning.
 - 3. Report findings, in writing, to architect indicating that all hardware is installed and functioning properly. Include recommendations outlining corrective actions for improperly functioning hardware if required.

3.5 SCHEDULE OF FINISH HARDWARE:

SET #1 - Restroom

Doors: 100, 101, 102, 103, 104 - Exterior

3 Hinges
1 Keypad Standalone Electronic Lock
1 Pull Plate
1 Push Plate
1 Closer
1 Kick Plate
1 Wall Bumper
1 Gasketing
1 Door Bottom
1 Saddle Threshold

CB199 5 X 4 1/2 48H-7R PATD 1018-3
1001-9

HD7016 JT
K0050 10" x 2" LDW B4E CS 1270CVPV
700 NA SMS-TEKS
36 EV SMS-TEKS
426 SSMS/EA

630 ST 626 BE 630 TR 630 TR 689 BE 630 TR 626 TR

NA NA NA

SET #2 - Plumbing Chase - Exterior

Doors: 107 - Exterior

3 Hinges
1 Lockset
1 Closer
1 Kick Plate
1 Wall Bumper 1 Gasketing

1 Door Bottom
1 Saddle Threshold

END OF SECTION

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. Interior gypsum board.
- B. Related Requirements:
 - 1. Section 099000 "Paints and Coatings" for wall finish requirements.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Mold- resistant gypsum board.
 - 2. Joint treatment materials.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.2 INTERIOR GYPSUM BOARD

- A. Mold- Resistant Gypsum Board: ASTM C1396/C1396M. With moisture and mold- resistant core and paper surfaces.
 - 1. Core: 5/8" (15.9mm)
 - 2. Long Edges: Tapered.
 - 3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D274

2.3 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 - 1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet.
 - 2. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.

2.4 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 - 1. Interior Gypsum Board: Paper.
- C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Prefilling: at open joints, rounded or beveled panel edges, and damaged surface areas, use setting- type taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners and trim flanges, use drying-type all – purpose compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 - 3. Fill Coat: For the second coat, use drying-type, all-purpose compound.
 - 4. Finish Coat: For the third coat, use drying-type, all-purpose compound.
 - 5. Skim Coat: for final coat of Level 5 finish, use drying-tape, all-purpose compound.

2.5 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.
 - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Fit gypsum panels around ducts, pipes, and conduits.
 - 2. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch wide joints to install sealant where sealant is required.

- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 3/8-inch- wide joints at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with backed, flexible, curing, paintable sealant.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Vertical surfaces: All except as otherwise noted.
 - 2. Horizontal surfaces: As indicated in Drawings.
- B. Single-Layer Application:
 - 1. Apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
 - 2. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.4 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints vertically at partition openings greater than 3' in width, at headwall ends where headwall is coplanar with adjacent partitions, and at a spacing not greater than 20' horizontally in otherwise uninterrupted partitions. Panel edges at control joints shall be trimmed with suitable accessory, and joints shall be backed and sealed with flexible, curing, paintable sealant.
- C. Interior Trim: Install in the following locations: All outside corners and edges, whether exposed to view or not shall be covered with a trim or reglet and finished to the same level of finish specified for the adjacent surface.
 - 1. Cornerbead: Use at outside corners unless otherwise indicated.
 - 2. LC-Bead: Use at panel edges.

3.5 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Where existing panels within the work limits and adjacent to new panels exhibit surface texture, they shall be finished to the same level as new partitions.
 - 1. Prepare existing textured surfaces by scraping down existing texture and roughening and cleaning paint to receive skim-coats.
 - 2. Apply adhesive primer for skim coats as recommended by skim coat compound manufacturer.
 - 3. Apply skim coats to achieve specified level of finish.
- E. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 - 1. Level 4: At exposed and semi-exposed panel surfaces.
 - 2. Level 4: At skim-coated existing panel surfaces.
 - 3. Level 2: At fully concealed panel surfaces.
- F. Texture: None. New and existing panel surface finishes shall be suitable for direct application of paint systems to achieve a smooth-wall finish.

3.6 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from construction and other causes during the remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Thermoset- rubber base.
 - 2. Rubber molding accessories.

1.3 ACTION SUBMITTALS

- A. Product Data: Provide data on specified products.
- B. Samples for Initial Selection: For each type of product indicated.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C).

1.5 FIELD CONDITIONS

- A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.
- B. Install resilient products after other finishing operations, including painting have been completed.

PART 2 - PRODUCTS

2.1 THERMOSET – RUBBER BASE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering product that may be incorporated into the work included, but are not limited to the following:
 - 1. Roppe Corporation
 - 2. Johnsonite
 - 3. Flexco

- B. Product Standard: ASTM F1861, Type TS (rubber, vulcanized thermoset), Group 1 (solid, homogenous).
 - 1. Style: Cove base
 - 2. Thickness: 0.125 inch
 - 3. Height 6"
 - 4. Corners: Job formed
 - 5. Colors: To be selected by architect from manufacturer's full range.

2.2 INSTALLATION MATERIALS

- A. A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that sub-floor surfaces have been properly prepared including flattening, leveling, patching and filling so that they are smooth and flat within the tolerances specified for that type of work and are ready to receive resilient flooring.

- A. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient and integral cove base.

- B. Verify that sub-floor surfaces are dust-free and free of substances which would impair bonding of adhesive materials to sub-floor surfaces.

- C. Verify that concrete sub-floor surfaces are ready for resilient flooring installation by testing for moisture emission rate and alkalinity; if test results at any location are not within the limits below, apply concrete moisture mitigating surface treatment:
 - a. Moisture emission rate: Not greater than 3 lb per 1000 sq ft per 24 hours when tested using calcium chloride moisture test kit for 72 hours.
 - b. Alkalinity: pH range of 5-9.
 - c. Submit written test reports to Architect prior to installation of flooring.

- D. Verify that required floor-mounted utilities are in correct location.

3.2 PREPERATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply moisture mitigation compounds to concrete if any test results indicate moisture emission rates in excess of maximum recommended by flooring adhesive manufacturer.
- C. Prohibit traffic until compounds and fillers are cured.
- D. Do not install floor coverings until they are the same temperature as the space where they are to be installed. Move floor coverings and installation materials into spaces where they will be installed at least 72 hours in advance of installation.
- E. Thoroughly clean prepared substrate.

3.3 INSTALLATION

- A. Fully back entire installation surface including bottom gap between lower edge of GWB and subfloor.
- B. Fully adhere resilient base to installation surface.
- C. Firmly butt all joints including joint between resilient base and door casings

3.4 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean in accordance with manufacturer's instructions.

3.8 PROTECTION

- A. Prohibit traffic of any kind on resilient flooring for 48 hours after installation of sheet flooring products and finish systems respectively.
- B. Fully cover resilient products after installation and again after application of polish and finish systems until Architect's Certification of Substantial Completion to protect from damage of any kind including any scuffing, caused by Contractor or other parties.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Galvanized Metal
 - 2. Gypsum Board
 - 3. Concrete traffic surfaces

1.2 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.
- B. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; current edition, www.paintinfo.com
- C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Master Painters and Decorators Association; 2004.

1.3 SUBMITTALS

- A. Product Data: Provide complete list of all products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. MPI product number (e.g. MPI #47).
 - 3. Manufacturer's installation instructions.
 - 4. If proposal of substitutions is allowed under submittal procedures, explanation of all substitutions proposed.
 - 5. Certification by manufacturer that products comply with Contract Documents and are compatible with applicable substrates and with each other.
 - 6. By manufacturer that all paints and coatings comply with VOC limits specified.
 - 7. Samples: For each type of topcoat product.
 - a. Submit three paper "drop" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
 - b. Where sheen is specified, submit samples in only that sheen.

- c. Where sheen is not specified, submit each color in each sheen available.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Supply 2 gallons of each color; store where directed. Label each container with color in addition to manufacturer's label.

1.5 QUALITY ASSURANCE

- A. Maintain one copy of relevant portions of MPI Architectural Painting Specification Manual on project site at all times.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.7 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 - PRODUCTS

2.1 MATERIALS -GENERAL

- A. Volatile Organic Compound (VOC) Content:
 - 1. Provide coatings that comply with the most stringent requirements specified in the following:

- a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- B. Paints and Coatings: Provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI Categories, except as otherwise indicated.
1. Provide ready mixed paints and coatings, except field-catalyzed coatings.
 2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- C. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified; commercial quality.
- D. Patching Material: Latex filler.
- E. Fastener Head Cover Material: Latex filler.

2.2 GLOSS / SHEEN

- A. Paint gloss/ sheen:
1. Restrooms and Janitors Closet: Eggshell
 2. Shower Rooms: Semi-gloss

2.3 PAINT AND CLEAR FINISH SYSTEMS – GENERAL

- A. Provide premium grade systems (2 topcoats) as defined in MPI Architectural Painting Specification Manual, except as otherwise indicated.
- B. It is the intent of this specification that all painted surfaces shall achieve a smooth, non-textured finish. Paint shall be chemically modified using manufacturer's recommended additives, and applied using such methods as will result in the desired smooth finish, free of brush marks or roller stipple when viewed under normal overhead light conditions from a distance of 5 feet.
- C. Provide colors as scheduled in this specification.

2.4 MANUFACTURERS

- A. Concrete Substrates, Traffic Surfaces:
1. Basis of Design: Rust-Oleum, Rocksolid Polycuramine Professional Floor Coating, Metallic.

- a. Color: To be selected by architect from manufacturers full range.
 - b. Topcoat: Low sheen textured clear.
- B. Galvanized – Metal Substrates:
- 1. Basis of Deign: Prime Coat, galvanized, water based, MPI #134
 - a. Benjamin Moore Ultra Spec HP Acrylic Metal Primer.
 - 2. Basis of Desing: Intermediate and Topcoat: MPI Gloss Level 3. MPI #139
 - a. Benjamin Moore Ultra Spec 500 Waterborne Interior Eggshell.
- C. Gypsum Board Substrates:
- 1. Basis of Design: Prime Coat, latex interior, MPI #50
 - a. Benjamine Moore Ultra Spec 500 Waterborne Interior Primer Sealer
 - 2. Basis of Design: Intermediate and topcoat, MPI #139, MPI Gloss Level 3
 - a. Benjamin Moore Ultra Spec 500 Waterborne Interior Eggshell.
- D. Finish Carpentry, Interior Window Trim:
- 1. Basis of Design
 - a. Benjamin Moore Stays Clear
- E. Plumbing, HVAC and Electrical: Applications include but are not limited to any exposed and semi-exposed pipes, ducts, conduits; equipment and devices.
- 1. Galvanized Ducts and Pipes-primer:
 - a. Basis of Design:
 - 1) Primer: Benjamine Moore Ultra Spec Acrylic Metal Primer HP P04, one coat
 - 2) Finish: Benjamine Moore Regal Select Pearl Finish 550-XXX, two coats
 - 2. New Steel Pipes
 - a. Basis of Design:
 - 1) primer: Benjamin Moore Super Spec HP Alkyd Metal Primer product P06 at 3.5 mils DFT, two coats
 - 2) Finish: Benjamine Moore Advance Waterborne Interior Alkyld Satin product #792-XXX
- 2.5 COLORS:
- A. PNT-1: Benjamin Moore, Color to be selected by architect from manufacturer’s full range.
 - B. PNT-2: Benjamin Moore, Color to be selected by architect from manufacturer’s full range.

PART 3 - EXECUTION

3.1 SCOPE – SURFACES TO BE FINISHED

- A. Paint all exposed surfaces except where indicated not to be painted or to remain natural; the term "exposed" includes areas visible through permanent and built-in fixtures when they are in place.

- B. Paint and/or apply clear finish as applicable to the surfaces described in PART 2, the surfaces indicated on the Drawings, and the surfaces as follows:
1. If a surface, material, or item is not specifically mentioned, paint in the same manner as similar surfaces, materials, or items, regardless of whether colors are indicated or not.
 2. Paint surfaces behind movable equipment and furnishings the same as similar exposed surfaces.
 3. Paint surfaces to be concealed behind permanently installed fixtures, equipment, and furnishings, using primer only, prior to installation of the permanent item.
 4. Finish top, bottom, and side edges of door frames the same as exposed faces.
 5. Paint dampers exposed behind louvers, grilles, and convectors and baseboard cabinets to match face panels.
 6. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.
- C. Do Not Paint or Finish the Following Items:
1. Items fully factory-finished unless specifically noted; factory-primed items are not considered factory-finished.
 2. Items indicated to receive other finish.
 3. Items indicated to remain naturally finished.
 4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
 5. Anodized aluminum
 6. Polished and brushed stainless steel items.
 7. Polished and brushed stainless steel, anodized aluminum, bronze, terne, and lead.
 8. Acoustical materials.
 9. Concealed piping, ductwork, and conduit.
 10. Concrete, UON

3.2 EXAMINATION

- A. Verify that surfaces are ready to receive Work as instructed by the product manufacturer.

- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- C. Test shop-applied primer for compatibility with subsequent cover materials; report incompatible primer conditions and submit recommended changes for Architect's approval.
- D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 - 1. Wood: 15 percent maximum. Allow wood products to acclimatize in space for a minimum of seven days prior to installation.
 - 2. Gypsum Board: 12 percent.

3.3 PREPARATION

- A. Prepare surfaces as specified in MPI Architectural Painting Specification Manual and as follows for the applicable surface and coating; if multiple preparation treatments are specified, use as many as necessary for best results; where the Manual references external standards for preparation (e.g. SSPC standards), prepare as specified in those standards; comply with coating manufacturer's specific preparation methods or treatments, if any.
 - 1. At a minimum provide, following the MPI Repaint Surface Preparation Standards, for the following substrates:
 - a. For metal substrates:
 - 1) MPI-RSP 1: Hand Cleaning
- B. Coordinate painting work with cleaning and preparation work so that dust and other contaminants do not fall on newly painted, wet surfaces.
- C. Surface Appurtenances: Prior to preparing surfaces or finishing, remove electrical plates, hardware, light fixtures, light fixture trim, escutcheons, machined surfaces, fittings, and similar items already installed that are not to be painted.
 - 1. If removal is impossible because of the size or weight of the item, provide surface-applied protection before preparation and finishing.
 - 2. After completing painting in each space or area, reinstall items removed using workers skilled in the trades involved.
- D. Surfaces: Correct defects and clean surfaces which affect work of this section. Remove or repair existing coatings that exhibit surface defects.
- E. Marks: Seal with shellac those which may bleed through surface finishes.
- F. Impervious Surfaces: Remove mildew by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

- G. Metal Door Frames to be Painted: Prepare and prime all exposed surfaces in accordance with paint manufacturer's recommendations regardless of condition of factory applied primer and/or finish in place on prefinished steel door frames as received.
- H. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.
- I. Interior Wood Items to Receive Transparent Finish: Sand wood to obtain a uniform appearance before immediately starting work. Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.

3.4 APPLICATION

- A. Apply products in accordance with manufacturer's instructions and as specified or recommended by MPI Manual, using the preparation, products, sheens, textures, and colors as indicated.
 - 1. Remove, refinish, or repaint work not complying with requirements.
- B. Do not apply finishes over dirt, rust, scale, grease, moisture, scuffed surfaces, or other conditions detrimental to formation of a durable coating film; do not apply finishes to surfaces that are not dry.
- C. Use applicators and methods best suited for substrate and type of material being applied and according to manufacturer's instructions.
 - 1. Brush Application: Use brushes best suited for the type of material applied; use brush of appropriate size for the surface or item being painted; produce results free of visible brush marks.
 - 2. Roller Application: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by manufacturer for the surface or item being painted; produce results free of visible roller and roller stipple marks.
 - 3. Spray Application: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.
 - 4. Where application method is listed in the MPI Manual for the paint system that application method is required; otherwise any application method recommended by manufacturer for material used and objects to be painted is acceptable.
- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate; provide total dry film thickness of entire system as recommended by manufacturer or as indicated per Article 2.4.A of this Section, whichever is greater.
 - 1. Number of coats and film thickness required are the same regardless of application method.

2. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until film is of uniform finish, color, and appearance.
- E. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive dry film thickness equivalent to that of flat surfaces.
1. Apply finish to completely cover surfaces with uniform appearance without brush marks, runs, sags, laps, ropiness, holidays, spotting, cloudiness, or other surface imperfections.
 2. Before applying finish coats, apply a prime coat of material recommended by manufacturer. Where evidence of suction spots or unsealed areas in first coat appear, recoat primed and sealed surfaces to ensure finish coat with no burn through or other defects due to insufficient sealing.
 3. Apply first coat to surface that has been cleaned, pretreated, or otherwise prepared as soon as practical after preparation and before subsequent surface deterioration.
 4. Do not apply succeeding coats until the previous coat has cured as recommended by manufacturer.
 5. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat will not cause the undercoat to lift or lose adhesion.
 6. If manufacturer's instructions recommend sanding to produce a smooth, even surface, sand between coats.
 7. Before applying next coat vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
 8. Pigmented (Opaque) Finishes: Provide smooth, opaque surface of uniform finish, color, appearance, and coverage.

3.5 CLEANING AND PROTECTION

- A. Collect waste material which may constitute a fire hazard, place in closed metal containers, and remove daily from site.
- B. At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from site.
- C. Protect other work, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting as approved by Architect.
- D. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
- E. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in MPI Manual.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Dimensional characters
- B. Related Sections:
 - 1. Section 061000 "Rough Carpentry" for backing.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For signs.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
 - 3. Show message list, typestyles, graphic elements, and layout for each sign at least 1/4 size
- C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
 - 1. Include representative samples of indicated typestyles and graphic symbols.
- D. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Include in maintenance manuals.

1.4 WARRANTY

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

1.5 FIELD CONDITIONS

- A. Field Measurements: Verify dimensional limits of wall area to which dimensional letters are to be anchored and location of backing into which dimensional letter support pins are to be embedded.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer to design sign structure and anchorage of dimensional character sign types according to structural performance requirements.
- B. Structural Performance: Signs and supporting elements shall withstand the effects of gravity and other loads within limits and under conditions indicated.
 - 1. Uniform Wind load
 - 2. Concentrated Horizontal Load
- C. Thermal Movements: For exterior fabricated channel dimensional characters, allow for thermal movements from ambient and surface temperature changes.

2.2 DIMENSIONAL CHARACTERS

- A. Cast Characters: Characters with uniform faces, sharp corners, and precisely formed lines and profiles, and as follows:
 - 1. Basis of Design: Gemini Cast Metal Letters
 - a. Or approved equal.
 - 2. Character Material: Cast aluminum
 - 3. Thickness: 1-1/4 inches
 - 4. Character Height: 10" High
 - 5. Finishes:
 - a. Baked-Enamel or Powder- Coat finish: Color to be selected by architect from manufacturer's full range of colors.
 - 6. Typeface: Arial
 - 7. Mounting: Projected spacer mount.

2.3 MATERIALS

- A. Aluminum Castings: ASTM B 26/B 26M, alloy and temper recommended by sign manufacturer for casting process used and for type of use and finish indicated.
- B. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.4 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, non-ferrous, noncorrosive, and compatible with each material joined including metal cladding and backing. Fasteners and anchors shall be concealed (blind), threaded studs welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.
- B. Adhesive: As recommended by sign manufacturer.

2.5 FABRICATION

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

2.6 GENERAL FINISH REQUIREMENTS

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

2.7 ALUMINUM FINISHES

- A. Baked- Enamel or powder- coat finish: AAMA 2603 except with a minimum dry fil thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
 - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 - 2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
 - 3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- B. Mounting Method:
 - 1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.

3.3 ADJUSTING AND CLEANING

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

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Painted Metal Signs.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For panel signs.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
3. Show message list, typestyles, graphic elements including raised characters and Braille, and layout for each sign at ½ scale.

1.3 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1

B. Maintenance Data: Include in maintenance manuals.

2.2 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Separation or delamination of sheet materials and components.

2. Warranty Period: Five years from date of Substantial Completion.

2.3 FIELD CONDITIONS

- A. Field Measurements: Verify dimensional limits of wall area to which dimensional letters are to be anchored and location of backing into which dimensional letter support pins are to be embedded.

2.4 PANEL SIGNS

- A. Panel Sign: Sign with smooth, uniform surfaces; with messages and characters having uniform faces, sharp corners, and precisely formed lines and profiles; as follows:
 1. Basis of Design: ACE Sign Systems, inc. APCO Graphics, Inc., Best Sign Systems, Inc. Diskey Architectural Signage Inc.
 - a. Or approved equal.
 2. Solid- Sheet Signs, Returns and Back: Steel sheet with finish specified in “surface finish and applied graphics subparagraph and as follows:
 - a. Thickness: Manufacturer’s standard for size of sign.
 - b. Surface- Applied, Flat Graphics: Applied paint.
 3. Sign- Panel Perimeter: Finish edges smooth.
 - a. Edge condition at vertical edges: Square.
 - b. Coner Condition in Elevation: Square
 4. Mounting: Manufacturer’s standard method for substrates indicated, projecting from wall, with concealed fasteners.
 5. Surface Finish and Applied Graphics:
 - a. Painted Finish and Graphics: Manufacturer's standard, factory-applied exterior grade sign paint, in color as selected by Architect from manufacturer's full range.
 - b. Overcoat: Manufacturer's standard baked-on clear coating.
 6. Flatness Tolerance: Sign shall remain flat or uniformly curved under installed conditions as indicated on Drawings and within a tolerance of plus or minus 1/16 inch (1.5 mm) measured diagonally from corner to corner.

2.5 MATERIALS

A. Steel Materials:

1. Steel Sheet: Uncoated, cold-rolled, ASTM A1008/A1008M, commercial steel, Type B, exposed or electrolytic zinc-coated, ASTM A879/A879M, Coating Designation 08Z (24G), with steel-sheet substrate according to ASTM A1008/A1008M, commercial steel, exposed.
2. Steel Members Fabricated from Plate or Bar Stock: ASTM A529/A529M or ASTM A572/A572M, 42,000-psi (290-MPa) minimum yield strength.
3. For steel exposed to view on completion, provide materials having flat, smooth surfaces without blemishes. Do not use materials whose surfaces exhibit pitting, seam marks, roller marks, rolled trade names, or roughness.

- ### B. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.6 ACCESSORIES

- ### A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following unless otherwise indicated:

1. Use concealed fasteners and anchors unless indicated to be exposed.
2. For exterior exposure, furnish stainless-steel or hot-dip galvanized devices unless otherwise indicated.
3. Exposed Metal-Fastener Components, General:
 - a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
 - b. Fastener Heads: For nonstructural connections, use flathead or oval countersunk screws and bolts with tamper-resistant Allen-head, spanner-head or one-way-head slots unless otherwise indicated.
4. Sign Mounting Fasteners:
 - a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material or screwed into back of sign assembly unless otherwise indicated.
 - b. Projecting Studs: Threaded studs with sleeve spacer, welded or brazed to back of sign material or screwed into back of sign assembly, unless otherwise indicated.

- c. Through Fasteners: Exposed metal fasteners matching sign finish, with type of head indicated, and installed in predrilled holes.
5. Inserts: Furnish inserts to be set by other installers into concrete or masonry work.
- B. Post-Installed Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 as appropriate for the substrate.
 1. Uses: Securing signs with imposed loads to structure.
 2. Type: Torque-controlled, expansion anchor.
 - C. Power-Actuated Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

2.7 FABRICATION

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, non-ferrous, noncorrosive and compatible with each material joined including wood board cladding and backing. Fasteners and anchors shall be concealed (blind), threaded studs welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.
- B. Adhesive: As recommended by sign manufacturer.

2.8 FABRICATION

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

- B. Brackets: Fabricate brackets, fittings, and hardware for bracket-mounted signs to suit sign construction and mounting conditions indicated. Modify manufacturer's standard brackets as required.

2.9 GENERAL FINISH REQUIREMENTS

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

2.10 STEEL FINISHES

- A. Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, and prepare for coating according to coating manufacturer's written instructions.
 - 1. For Baked-Enamel or Powder-Coat Finish: After cleaning, apply a conversion coating compatible the organic coating to be applied over it.
- B. Prime Finish: After surface preparation and pretreatment, apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer.
- C. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils (0.05 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
 - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.

2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Mounting Method:

1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.

3.3 ADJUSTING AND CLEANING

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

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Solid plastic toilet compartments.
- B. Urinal screens.

1.2 RELATED REQUIREMENTS

- A. Section 102800 - Toilet and Bath Accessories.

1.3 REFERENCE STANDARDS

- A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2010.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.

1.6 SUBMITTALS

- A. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings, and backing layout.
- B. Product Data: Provide data on panel construction, hardware, and accessories.
- C. Samples: Submit two samples of partition panels, 4 x 4 inch in size illustrating panel finish, color, and sheen.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Material: Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - a. Door Hinges: One hinge with associated fasteners.
 - b. Latch and Keeper: One latch and keeper with associated fasteners.
 - c. Door Bumper: One bumper with associated fasteners.
 - d. Door Pull: One door pull with associated fasteners.
 - e. Fasteners: 10 fasteners of each size and type.

1.8 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements, and coordinate before fabrication.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with applicable provisions in the U.S. Department of Justice, 2010 ADA Standards for Accessible Design” and ICC A117.1 for toilet compartments designated as accessible.

2.2 MANUFACTURERS – SOLID PLASTIC TOILET COMPARTMENTS

- A. Basis- of – Design: Bradley “Bradmar Partition Series 700” or approved equal.

A.3 COMPONENTS

A. Toilet Compartments:

- a. Door, panel, screen and pilaster construction: Solid molded high density polyethylene (HDPE) not less than 1” thick, seamless, with eased edges, no- sightline system, and with homogenous color and pattern throughout thickness of material.
- b. Toilet Enclosure: Floor and ceiling anchored, provide manufacturers standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at tops and bottoms of pilasters. Provide shoes and sleeves (caps) at pilasters to conceal anchorage.
- c. Urinal- Screen: Wall mounted with continuous panel brackets.
- d. Thickness: 1 inch min.
- e. Hinges: Integral hinges.
- f. Heat- Sink Trap: Manufacturer’s standard continuous, stainless steel strip fastened to exposed bottom edges of solid-plastic components to hinder malicious combustion.
- g. Color: To be selected by architect from manufacturers full range of colors.
- h. Thickness of Pilasters: 1 inch.
- i. Door Size and Swings: Unless otherwise indicated, provide 24 inch wide, in swinging doors for standard toilet compartments, 36 inch wide, out swinging doors with a minimum 32 inch wide, clear openings for ADA accessible stalls.

2.4 ACCESSORIES

- A. Pilaster Shoes and Caps: Formed ASTM A 666, Type 304 stainless steel with No. 4 finish, 3 in high, concealing floor fastenings.

1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.
- B. Head Rails: Hollow stainless steel tube, 1 x 1-5/8 inch size, with anti-grip strips and cast socket wall brackets.
- C. Pilaster Brackets: Satin stainless steel.
- D. Wall Brackets: Continuous type, satin stainless steel.
- E. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.
 1. For attaching panels and pilasters to brackets: Through-bolts and nuts; tamper proof.
- F. Hardware: Satin stainless steel:
 1. Hinges: Manufacturers minimum 0.062-inch-thick stainless steel continuous, cam type that swings to be closed or partially open position, allowing emergency access by lifting door. Mount through bolts.
 - a. Self-closing at ADA stall
 2. Door Latch and keeper: Manufacturers surface mounted, cast- stainless steel unit designed to resist damage due to slamming, with combination rubber-faced door strike and keeper, and with provisions for emergency access. Provide units that comply with ADA standards.
 4. Coat hook Stainless steel hook with rubber tipped bumper. One per compartment, mounted on door 48 inches above finish floor elevation. Sized to prevent in swinging door from hitting compartment- mounted accessories.
 5. Door Bumper: Manufacturers heavy-duty, stainless-steel bumper at out swinging doors.
 6. Door Pull: Manufacturers heavy -duty stainless steel pull at out swinging doors that complies with ADA standards. Provide on both sides of doors at compartments designated as accessible. Mount with through bolts.

2.5 FABRICATION

- A. Fabrication General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through- partition toilet accessories where required for attachment of toilet accessories.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify correct spacing of and between plumbing fixtures.

- C. Verify correct location of built-in framing, anchorage, and bracing.

3.2 INSTALLATION

- A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.
- B. Maintain 3/8 to 1/2 inch space between wall and panels and between wall and end pilasters.
- C. Attach panel brackets securely to walls using anchor devices.
- D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.
- E. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.
- F. Install partitions so that grab bars attached to those partitions can withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.
- G. Stirrup Brackets: Secure panels to walls and to pilasters with no fewer than three brackets attached at midpoint and near top and bottom of rail.

3.3 ERECTION TOLERANCES

- A. Maximum Variation From True Position: 1/4 inch.
- B. Maximum Variation From Plumb: 1/8 inch.

3.4 ADJUSTING

- A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.
- B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.
- C. Adjust adjacent components for consistency of line or plane.

END OF SECTION

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. Solid Surface Shower Receptors
- B. Related Sections:
 - 1. Section 061000 "Rough Carpentry" for backing.
 - 2. Section 102200 "Shower Surround"

1.3 REFERENCES

- A. American National Standards Institute (ANSI)
- B. American with Disabilities Act Accessibility Guidelines (ADAG)

1.4 SYSTEM DESCRIPTION

- A. Performance requirements: Provide shower receptors that conform to the following requirements of regulatory agencies.
 - 1. Provide shower receptors that conform to ANSI 124.1.2-2005 when tested for workmanship and finish, structural integrity and material characteristics.
 - 2. Fungal and Bacterial Resistance: Provide Solid Surface that does not support fungal and bacterial growth as tested in accordance with ASTM G-21 and ASTM G-22.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:
 - 1. Samples: Verification samples 1"x3", Color samples
 - 2. Material and finish descriptions.
 - 3. Manufacturer's Warranty.
 - 4. Manufacturer's installation instructions.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Include in maintenance manuals.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of shower surround and enclosures that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOLID SURFACE SHOWER PAN

- A. ADA roll-in Shower Receptor:
- B. Basis of Design: Inpro Corporation, manufactured ADA- Roll in Shower Receptor
 - 1. Size: 62" x 31 1/16" (60 3/8" x 30 1/4" Finished).
 - 2. Drain location: Center
 - 3. Shower drain shall be Oatey number 42150, Brass, No-caulk, Drain w/Brass or Polished Stainless Steel Strainer. Drain body is sealed to shower base with a fiber and rubber washer. Drain is secured to 2", 40 DWV pipe with a mechanically compressed gasket that does not require caulking. Drain top to accommodate 4 1/4" Universal Snap-Tite Strainer.
 - 4. Color: to be selected by architect from manufacturer's full line of colors.

2.2 MATERIALS

- A. Solid Surface: Shower receptors shall be manufactured from polyester/acrylic blended resins with natural filler material.
- B. Receptor floor to be solid cast product with integral threshold and water barrier.

2.3 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

2.4 DELIVERY, STORAGE, AND HANDLING

- A. A. Deliver materials in unopened factory packaging to the jobsite

- B. B. Inspect materials at delivery to assure that specified products have been received.
- C. C. Store in original packaging in an interior climate controlled location away from direct sunlight.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions in which the shower base will be installed.

3.2 INSTALLATION

- A. General: Install components plumb and level, scribe adjacent finishes, in accordance with approved shop drawings and recommended installation instructions.
- B. Accessibility Requirements: Recess in slab so threshold does not exceed ½" per ADA requirements.

3.3 CLEANING

- A. At completion of the installation, clean surfaces in accordance with manufacturer's written instructions.

END OF SECTION

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. Shower Surround
- B. Related Sections:
 - 1. Section 061000 "Rough Carpentry" for backing.
 - 2. Section 102800 "Toilet and Bath Accessories"
 - 3. Section 102116 "Shower Pan"

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:
 - 1. Detail drawings: mounting details with appropriate adhesives for specific project substrates.
 - 2. Samples: Verification samples, Color samples.
 - 3. Material and finish descriptions.
 - 4. Manufacturer's Warranty.
 - 5. Manufacturer's installation instructions.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Include in maintenance manuals.

1.5 PRODUCT REQUIREMENTS

- A. Performance requirements: Shower Surround system that conforms to the following requirements of regulatory agencies.
 - 1. Fire Performance Characteristics: Provide shower surrounds conforming with NFPA Class A fire rating. Surface burning characteristics as determined by ASTM E84 shall be flame spread of 25 or less and smoke development of 450 or less.

2. Mold Growth Resistance: Provide material that is resistant to mold growth when tested in accordance with ASTM D3273.
3. Impact Resistance: Provide material that is resistant to impact when tested in accordance to ASTM D4226.
4. Effect of Household Chemicals: Provide material that is effective against reaction to household chemicals when tested in accordance with ASTM D1308.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in unopened factory packaging to the jobsite.
- B. Inspect materials at delivery to ensure that specified products have been received.
- C. Store in original packaging in a climate controlled location away from direct sunlight.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of shower surround and enclosures that fail in materials or workmanship within specified warranty period.
 1. Warranty Period: lifetime from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 Shower Surround

- A. Shower Surround:
 1. Basis of Design: InPro Corporation, Continuum Shower Surround
 - a. Or approved equal.
 2. Thickness: .080 (2mm) standard.
 3. Size: 47" x 118.75
 4. Pattern: Vertical Plank
 5. Color: To be selected by architect from manufacturer's full range of colors
- B. Accessories:
 1. Trim:
 - a. Perimeter cap
 - b. Vertical divide bar
 - c. Inside corner
 - d. Outside corner
 2. Fastfill caulk

2.2 MATERIALS

- A. Vinyl: Shower walls shall be manufactured from 100% chemical and stain resistant polyvinyl chloride. No plasticizers shall be added (plasticizers may aid in bacterial growth).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions in which the shower walls will be installed.
 - 1. Complete all finishing operations, including painting, before beginning installation of materials.
 - 2. Wall surface shall be free from dirt, grease and loose paint.

3.2 INSTALLATION

- A. General: Locate the shower surrounds as indicated on the approved detail drawing for the appropriate substrate and in compliance with the manufacturer's installation instructions. Install level and plumb at the height indicated on the drawings.
- B. Adhere to porous substrates with manufacturers recommended adhesive, a freeze-thaw stable, nonflammable, high strength, water-based adhesive that trowels on and allows approximately 20 minutes working time before firming.
- C. Adhere to non-porous substrates with manufacturers recommended adhesive, a freeze-thaw stable, nonflammable, high strength, water-based adhesive that trowels on and allows approximately 20 minutes working time before firming.

3.3 CLEANING

- A. At completion of the installation, clean surfaces in accordance with manufacturer's written instructions.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Vinyl PVCu Sheet Wall Covering.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product:
 - 1. Include construction details, material description, impact strength, size, and finishes.
- B. Shop Drawings:
 - 1. Construction details, material description, impact strength, show location and extent. Indicate pattern placement, seams, and termination points.
- C. Samples for selection:
 - 1. For each type of wall covering and for each color, pattern, texture, and finish specified.

1.4 INFORMATIONAL SUBMITTALS

- A. Product test reports.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data.
- B. Warranties:
 - 1. Manufacturer's standard warranty against material and workmanship defects.
 - a. Minimum five-year warranty on material defects.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Store wall protection in original undamaged packages and containers inside well vented area protected from weather, moisture, soiling, extreme temperatures and humidity.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Verify wall materials comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates in accordance with test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Surface-Burning Characteristics: In accordance with ASTM E84. Identify products with appropriate markings of applicable testing agency:
 - a. WP-1: Class A.
 - 2. Fire-Growth Contribution: No flashover and heat and smoke release when tested in accordance with NFPA 265.

2.2 MANUFACTURERS:

- A. Basis of Design Manufacturer: WP-1: Acrovyn.
- B. Basis of Design Product: Construction Specialties Acrovyn 4000.
- C. Substitutes: Any product meeting or exceeding the material physical, performance, aesthetic, sustainability and warranty criteria of the Basis of Design product and indicated herein. See Section 012500 Substitution Procedures.
- D. Sheet Wall Covering:
 - 1. Impact Strength: ASTM F476-84:
 - a. .06": Failure at 8"
 - b. .04": Failure at 6"
 - 2. Chemical Resistance: ASTM D543 – See Acrovyn 4000 chemical resistance test summary.
 - 3. Thickness: and .04".
 - 4. Sheet Size: 4' x 8'
 - 5. Installation Method: Fully adhered.
 - 6. Seams and Joints: Security sealant application – color match adjacent sheet.
 - 7. Colors and Patterns:
 - a. WP-1: Acrovyn Solid Colors.
 - 1) Color to be selected by architect from manufacturer's full range.
 - 8. Accessories:
 - a. Divider trim, corner trim, top caps
 - b. Adhesives: Manufacturer's recommended adhesive and primers.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances that could impair bond of wall covering, including dirt, oil, grease, mold, and mildew.
- C. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.
- D. Application over painted surfaces: Sand gloss, semigloss, and eggshell finishes with fine sandpaper.
- E. Apply primer as recommended by adhesive and wall-covering manufacturer.
- F. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

3.2 INSTALLATION OF WALL COVERING - GENERAL

- A. Comply with wall-covering manufacturers' written installation instructions applicable to products and applications indicated.
- B. Install wall covering using full-spread adhesive application unless otherwise indicated by manufacturer to form a tamper-proof surface without bubbles, voids, or unbonded edges.
 - 1. Wall covering that is not fully bonded will be rejected.
- C. Install seams vertical and plumb at least 6 inches (152 mm) from outside corners and 6 inches (152 mm) from inside corners unless a change of pattern or color exists at corner. Horizontal seams are not permitted.

3.3 INSTALLATION OF WALL COVERING – WP-1

- A. Install panels in the largest panel size available to minimize seams.
- B. Install panels full height with no horizontal seams, running panels from top of underlayment to underside of finish ceiling assembly unless otherwise indicated in Drawings. Where panels extend to underlayment, panel bottom edges shall be hard to it.
- C. Install adjacent wall covering panels leaving joint between panels of size recommended by sealant manufacturer for application of sealant.
- D. Remove excess adhesive at seams, perimeter edges, and adjacent surfaces.

3.4 CLEANING

- A. Immediately upon completion of installation, clean material in accordance with manufacturer's written recommended cleaning methods.
- B. Remove surplus materials, rubbish, and debris resulting from installation as work progresses and upon completion of work.

3.5 PROTECTION

- A. Protect installed materials to prevent damage by other trades. Use materials that may be easily removed without leaving residue or permanent stains.

END OF SECTION

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. Toilet room accessories.
 - 2. Shower room accessories.
- B. Related Sections:
 - 1. Section 061000 "Rough Carpentry" for backing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:
 - 1. Construction details and dimensions.
 - 2. Anchoring and mounting requirements including requirements for cutouts in other work and substrate preparation.
 - 3. Material and finish descriptions.
 - 4. Features that will be included for Project.
 - 5. Manufacturer's Warranty.
- B. Product Schedule:
 - 1. Identify locations using room designations indicated.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Include in maintenance manuals.

1.5 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

1.6 WARRANTY

- A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 15 years from date of Substantial Completion.
- B. Special Hand Dryers Warranty: Manufacturer agrees to repair or replace hand dryers that fail in materials or workmanship within specified warranty period.

1.7 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Desing accessories and fasteners to comply with the following requirements:
 - 1. Grab Bars: Installed units must be able to resist 250 lb concentrated load applied from direction or point.

PART 2 - PRODUCTS

2.1 GARMENT HOOKS

- A. Garment Hooks:
 - 1. Basis of Design: Bobrick B-682
 - 2. Material and Finish: Stainless Steel, satin finish.
 - 3. Install where indicated in Drawings.

2.2 COMMERCIAL WASHROOM ACCESSORIES

- A. Toilet Paper Dispenser (TPD):
 - 1. Basis-Of Design: Bobrick B-4288
 - a. Or approved equal
 - 2. Description: Single-roll dispenser.
 - 3. Mounting: Surface mounted.
 - 4. Capacity: Designed for 4-1/2- or 5-inch-diameter tissue rolls.
 - 5. Material and Finish: Stainless Steel, ASTM A480/A480M no. 4 finish (satin)
 - 6. Install where indicated in Drawings.
- B. Toilet Seat Cover Dispenser (TSCD)
 - 1. Basis-Of Design: Bobrick B-221
 - 2. Mounting: Surface with concealed fasteners, provide wood backing.
 - 3. Material and Finish: Stainless Steel, ASTM A480/A480M no. 4 finish (satin)
 - 4. Install where indicated in Drawings.
- C. Grab bar (GB):
 - 1. Basis of Design: Bobrick B-5806
 - a. Or approved equal.

2. Description: Straight grab bar, 1 ¼" diameter tubing.
 3. Mounting: Flanges with concealed fasteners, provide wood backing.
 4. Length: 18, 36 and 42 inches (one set per ADA toilet)
 5. Material and Finish: Stainless Steel, ASTM A480/A480M no. 4 finish (satin)
 6. Install where indicated in Drawings.
- D. Diaper-Changing Station:
1. Basis of Design: Bobrick KB310-SSWM
 - a. Or approved equal
 2. Description: Horizontal unit that opens by folding down from stored position with two handles that rest below 27" for cane detection when in open position.
 - a. Engineered to support a minimum of 200 lb. static load when opened.
 3. Mounting: Surface mounted
 4. Operation: By pneumatic shock-absorbing mechanism.
 5. Material and Finish: Stainless Steel, ASTM A480/A480M no. 4 finish (satin)
 6. Liner Dispenser: Built in.
 7. Install where indicated in Drawings.
- E. Waste Receptacle (WR):
1. Basis of Design: Bobrick B-279
 - a. Or approved equal.
 2. Mounting: Surface mounted.
 3. Minimum Capacity: 6.4 gallons.
 4. Material and Finish: Stainless Steel, ASTM A480/A480M no. 4 finish (satin)
 5. Liner: Reusable vinyl liner.
 6. Install where indicated in Drawings.
- F. Sanitary-Napkin Disposal Unit:
1. Basis of Design: Bobrick, B-35139
 - a. Or approved equal.
 2. Mounting: Surface mounted
 3. Door or Cover: Self-closing, disposal-opening cover
 4. Receptacle: Removable.
 5. Material and Finish: Stainless Steel, ASTM A480/A480M no. 4 finish (satin)
 6. Install where indicated in Drawings.
- G. Mirror Unit: MIR
1. Basis of Design: Bobrick, B-165 2436
 - a. Or approved equal.
 2. Frame: Stainless-steel channel.
 3. Corners: Manufacturer's standard.
 4. Size: As indicated on drawings
 5. Install where indicated in Drawings.
- H. Liquid-Soap Dispenser: SD
1. Basis of Design: Bobrick, B-2012
 - a. Or approved equal.
 2. Description: Automatic soap dispenser with infrared sensor to detect hands, battery operated.
 3. Mounting: Surface mounted

4. Capacity: 30-fl oz.
5. Material and Finish: Stainless Steel, ASTM A480/A480M no. 4 finish (satin)
6. Refill Indicator: LED indicator.
7. Low- Battery Indicator: LED indicator.

2.3 HAND DRYERS

A. Warm- Air Dryer:

1. Basis of Design: Bobrick B-7128
 - a. Or approved equal.
2. Mounting: Surface mounted.
 - a. Protrusion limit: Installed unit protrudes 4" maximum from wall surface.
3. Operation:
 - a. Infrared- sensor activated with timed power cut-off switch.
 - b. Timed Shutoff: 90 seconds
4. Maximum Sound Level: 71 dB.
5. Material and Finish: Stainless Steel, ASTM A480/A480M no. 4 finish (satin)
6. Electrical Requirements: 208 V, coordinate with electrical.

2.4 UNDERLAVATORY GUARDS

A. Under lavatory Guard:

1. Basis of Design: TruBro lav Guard 2"
 - a. Or approved equal.
2. Description: Insulation pipe covering for supply and drain piping assemblies that prevents direct contact with and burns from piping.
3. Material and Finish: Antimicrobial, molded plastic, white

2.5 COMMERCIAL SHOWER AND BATH ACCESSORIES

- ### A. Shower Curtain Rod: Stain Stainless steel tube, 1 inch (25 mm) outside diameter, 0.04 inch (1.0 mm) wall thickness, satin-finished, with 3 inch (75 mm) outside diameter, minimum 0.04 inch (1.0 mm) thick satin-finished stainless steel flanges, for installation with exposed fasteners.

B. Shower Curtain:

1. Material: Cotton, machine washable, and mildew- resistant.
2. Grommets: Stainless steel; pierced through top hem on 6" centers.
3. Color: white
4. Shower Curtain Hooks: Chrome-plated or stainless steel spring wire designed for snap closure.

C. Folding Shower Seat:

1. Basis of Design: Grabbar Specialists, Adult Teakwood Folding Shower Seat, 62 Series
 - a. Or approved equal.
2. Description: Folding shower seat, wall mounted.
3. Mounting: Wall mounted
4. Material and Finish: 1" diameter, 18 gauge and 1.25" x 1.25" 16 gauge, type 304 stainless steel tubing with #4 satin finish.

5. Top: Mildew resistant slatted Teakwood.
6. Capacity: Minimum 400 lbs. Install per manufacturer's instructions.
7. Compliance: ADA accessible.
8. Size: 26" x 16"

2.6 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch (0.8-mm) minimum nominal thickness unless otherwise indicated.
- B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.
- C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch (0.9-mm) minimum nominal thickness.
- D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 (Z180) hot-dip zinc coating.
- E. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.
- I. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.7 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

- B. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

B. Related Sections:

1. Section 061000 "Rough Carpentry" for backing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:

1. Material and finish descriptions.
2. Manufacturer's Warranty.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.4 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguisher:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Larsens Manufacturing Company or comparable product.
 - a. Regular Dry-Chemical Type: UL-rated 2A:10B:C 5lb in manufacturer's standard enameled container.
 - 2. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.

2.3 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
 - 1. Mounting Brackets: Top of fire extinguisher to be at 42 Max inches above finished floor.
- C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Basic Plumbing Requirements specifically applicable to Division 22 as delineated in these specifications, in addition to Division 01 – General Requirements.
- B. All provisions of Section 230000, General HVAC Requirements, apply to Division 22.

1.2 SCOPE

- A. Furnish all labor, materials, equipment, supervision of labor and performance of all operations required to completely install satisfactorily operating plumbing systems as defined herein and on Drawings.
 - A. Major items of work include, but are not limited to, the installation of the following systems:
 - 1. Construction of a new restroom facility complete with separate men's and women's toilet and shower rooms with plumbing fixtures, floor drains, storage tank-type propane-fired water heaters, ASSE-1070 compliant tempering valves, water, waste, and vent piping. Toilet rooms, equipment, and piping are to be able to be isolated and drained for winterization.
 - 2. Hydration stations complete with dual level drink fountains and bottle fillers.
 - B. Connection of the new building water service to existing water distribution system on-site and sanitary drain to existing waste main on-site serving existing toilet facility being demolished as part of this project.
 - C. The drawings and specifications are complementary to each other. What is shown on one is as binding as if called for in both. The drawings are generally diagrammatic and are intended to show mechanical details in a schematic fashion. Do not scale mechanical drawings. Exact locations are not shown unless so indicated or specifically dimensioned. Typical connection diagrams are schematic and do not show the actual physical arrangement of equipment.
 - D. The plans do not necessarily show complete details of all the features that may affect the mechanical installations; however, it is the intent of the contract documents to provide a complete and satisfactorily working installation.
 - E. Submit in writing to the Owner's Representative for review details of any necessary or proposed departures from these Contract Documents and reasons therefore, as soon as practicable within 30 days after the award of the contract. Make no such departure without prior written approval of the Owner's Representative.

- F. The drawings and specifications are complementary to each other. What is shown on one is as binding as if called for in both. The drawings are generally diagrammatic and are intended to show mechanical details in a schematic fashion. Do not scale mechanical drawings. Exact locations are not shown unless so indicated or specifically dimensioned. Typical connection diagrams are schematic and do not show the actual physical arrangement of equipment.
- G. The plans do not necessarily show complete details of all the features that may affect the mechanical installations; however, it is the intent of the contract documents to provide a complete and satisfactorily working installation.
- H. Submit in writing to the Owner's Representative for review details of any necessary or proposed departures from these Contract Documents and reasons therefore, as soon as practicable within 30 days after the award of the contract. Make no such departure without prior written approval of the Owner's Representative.

1.3 WORDING OF THE SPECIFICATIONS

- A. These Specifications are of the abbreviated or streamlined type and frequently include incomplete sentences. However, periods are used for clarity. Words such as "shall", "shall be", "the CONTRACTOR shall", and similar mandatory phrases shall be supplied by inference in the same manner, as they are required for the notes on the drawings.

1.4 CODES AND REGULATIONS

- A. All Work hereunder shall be strictly in conformance with applicable codes and regulations. All Work shall be in accordance with the 2018 Uniform Plumbing Code, 2021 International Mechanical Code, 2021 International Building Code, 2021 International Fire Code, the most recent edition of NFPA, local and State of Alaska code modifications insofar as minimum requirements are concerned, but the Drawings and Specifications shall govern in case the minimum requirements are exceeded. All electrical equipment shall bear the UL label.

1.5 SUBMITTALS

- A. General: Provide submittals according to Conditions of Contract, Division 1 Specifications Sections, and as required hereunder. Drawings and general provisions of the Contract, including General, Supplementary Conditions, and all Division 1 Specification Sections, apply to this Section. Approval of the data shall not eliminate responsibility for compliance with the Drawings or Specifications unless specific attention has been called in writing to proposed deviations at the time of transmittal of the data and such deviations have been approved, nor shall it eliminate the responsibility for freedom of errors of any sort in the data. All Mechanical submittal data for Project construction is to be turned in for approval at the same time in order for an efficient review process. Partial submittals may be rejected until the full submittal is received. See Division 0 Specifications for Buy American compliance requirements.

- B. Specified Products: Trade names and catalog numbers of manufactured products included herein are intended to indicate the type, size, and grade of quality of equipment and materials required and such equipment and materials are approved for installation, subject to full compliance with the Specifications. Except where single manufacture is specified for standardization, requests for approval of other manufacturers than those specified must be accompanied by complete descriptions including overall dimensions, performance data, and, if catalog material, identification of specific products or items proposed.
- C. As-Built Drawings: As-built drawings shall be required from all Mechanical Subcontractors and shall accurately show all changes from Contract Documents for all piping, ductwork, and equipment. As-built drawings shall be updated daily and available for inspection on-site by the ARCHITECT.
- D. Operating and Maintenance Data: See Division 1 for the number of sets of data to be provided for submittal and additional requirements. Provide a minimum of four (4) copies. The following data shall be provided to the ARCHITECT for approval 30 days prior to the request for Substantial Completion inspection. Except for the valve directory and nameplate directory, the data shall be provided complete at one time. Partial or separate data will be returned for completion. The valve directory and nameplate directory may be provided for approval previous to the other data. The first section of the O&M manual shall be as listed in the following subparagraphs in order presented hereunder. All of the following subparagraphs' sections shall be furnished with permanent plastic see-through covers. See requirements under 1.4.C for additional submittal and formatting requirements.
1. Cover and Index sheets as in 1.4.C. above.
 2. Description of systems and operating instructions: The Contractor shall prepare a brief type written description of all new and modified systems, explaining how the systems operate and indicating the proper settings of controls and switches. The instructions are to include all information required for the proper settings of controls and switches. The instructions are to include all information required for the proper operation of the systems. Technical knowledge on controls or adjustments requiring specialized technicians should not be included in the instructions.
 3. Nameplate Directory: List of all new heat pumps, air handlers, fans, water heaters, tanks, thermostatic mixing valves, pumps, unit heaters, cabinet unit heaters, air conditioning units, and other equipment nameplates, giving manufacturer's nameplate data, nameplate designation, location of equipment, area served, switch location, and normal position of the switch. Motor data must include the horsepower, voltage, full load amperage, phase, etc. See Section 220553 - Mechanical Identification.
 4. Manufacturers' Literature: Manufacturers' instructions for operation and maintenance of all mechanical equipment and specialties, including replacement parts lists, capacity curves or charts, equipment data sheets, manufacturers' literature on the equipment, and as-built wiring diagrams and control drawings, all suitable for side binding to 8-1/2 x 11 inch size. All data not applicable to the job is to be crossed out or deleted. Manuals

turned in for review with non-applicable data not crossed out shall be returned to the Contractor.

5. Maintenance Instructions: Typewritten instructions for the maintenance of the systems, listing each service required on all of the mechanical equipment, including inspections, lubrication, cleaning, checking, and all other operations required. The list is to include all types of bearings installed on the equipment and the type of lubricant required.
 6. Maintenance Schedule: List of each item of mechanical equipment requiring inspection, lubrication, cleaning, or service including the type of bearings and type of lubricating means for each piece of equipment. Each item of equipment is to be listed separately with the service required. List to include the times during the year when such inspection and maintenance shall be performed. The specific maintenance required shall be referenced back to the maintenance instructions.
- E. Submit prior to Substantial Completion Inspection and Final Inspection a detailed list of equipment and systems that will not be completed for the completion date. Include status and information of deficiencies from all previous inspection reports.
- F. Submit prior to Re-inspections of Substantial Completion Inspections, if applicable, and the Final Inspection a marked copy of the previous Engineers Inspection Reports detailing all items that have been completed and all items that have not been completed with reasons thereof. Re-inspection or Final Inspection will not occur until receipt of this list.

1.6 COOPERATIVE WORK

- A. The Work hereunder shall be coordinated between various mechanical Sections and with the Work specified under other divisions or contracts toward rapid completion of the entire Project. If any cooperative Work must be altered due to lack of proper supervision hereunder, or failure to make proper provisions in time, then the Work hereunder shall include all expense of such changes as are necessary to be made in the Work under other divisions and contracts, and such changes shall be directly supervised by the ARCHITECT and shall be made to the satisfaction of the ARCHITECT.
- B. In general, pitched piping and ductwork shall take preference in location within the Project area. Coordination of all drain valves, duct access doors, and other equipment requiring access and maintenance procedures is required with all building components during construction for maximum accessibility and proper location as intended. In many portions of the building, piping mains, and piping branches, as well as some duct branches will need to be installed in the joist space to allow for installation of duct mains. Coordinate closely with all other Contractors.

1.7 QUALITY ASSURANCE

- A. Perform Work in conformance with all applicable codes, regulations, local ordinances, contract documents, and generally accepted good practice. If

discrepancies exist between Specifications and Contract Drawings then the solution that provides the Owner with the highest quality of product or installation shall be deemed as intended by the Contract Documents.

- B. All sheet metal workers shall have a minimum documented sheet metal fabrication and installation experience in commercial or industrial facilities of 3 years or be enrolled in an Alaska Department of Labor approved Sheet Metal Apprentice program. The ratio of on-site workers shall not exceed 3 apprentices or sheet metal workers for every one foreman. A foreman is defined as a sheet metal worker with minimum 3 years experience as detailed above or is an approved Journeyman.
- C. All Plumbers and Pipe Fitters shall have a minimum documented installation experience in commercial or industrial facilities of 3 years or be enrolled in an Alaska Department of Labor approved Plumbers and Pipe Fitters Apprentice program. The ratio of on-site workers shall not exceed 2 apprentices or pipe fitters for every one Journeyman.

1.8 FIELD MEASUREMENTS

- A. See Division 1 for specific requirements.
- B. Verifications: All measurements shall be verified at the site and prior to fabrications of equipment and systems. The existing conditions shall be fully observed before beginning the Work hereunder, and the Work hereunder executed in full coordination with the existing conditions observed. All hazardous material including asbestos materials that are discovered during the course of construction shall be immediately brought to the attention of the ARCHITECT for action. All Work performed with hazardous materials not approved by the Owner shall be at the full responsibility of the contractor and not the Owner.
- C. Changes: Variations apparently necessary due to existing conditions shall be made only on approval in writing by the ARCHITECT.

1.9 WARRANTY

- A. See Division 1 for specific requirements regarding: Product warranties and product Bonds.
- B. CONTRACTOR shall provide continuous and generally trouble-free operation of the mechanical systems for the time period listed in Division 1 or for one year after Substantial Completion whichever time period is longer. The operation and maintenance of systems other than incidental operations such as room thermostat settings or changing of air filters, shall be the sole responsibility of the contractor and shall be addressed by the contractor immediately if deficiencies are present. Leaking of valves, flanges, or air vents shall be addressed immediately by the contractor during the warranty period. Control settings, noise problems, and other deficiencies resulting in unsatisfactory environmental conditions shall be addressed immediately.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 220510

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:
- B. Escutcheons.

1.3 ACTION SUBMITTALS

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

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

- A. One-Piece, Steel Type: With polished, chrome-plated finish and setscrew fastener.
- B. One-Piece, Stainless-Steel Type: With polished stainless-steel finish.
- C. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.
- D. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped steel with polished, chrome-plated finish and spring-clip fasteners.
- E. One-Piece, Stamped-Steel Type: With polished, chrome-plated finish and spring-clip fasteners.
- F. Split-Plate, Stamped-Steel Type: With polished, chrome-plated finish; concealed hinge; and spring-clip fasteners.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.
- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.
- C. Escutcheons for New Piping:
 - a. Insulated Piping: One-piece cast brass with polished, chrome-plated finish or one-piece stamped steel or split-plate, stamped steel with concealed hinge with polished, chrome-plated finish.
 - b. Bare Piping at Wall Penetrations in Finished Spaces: One-piece steel with polished, chrome-plated finish or one-piece stainless steel with polished stainless-steel finish or one-piece stamped steel or split-plate, stamped steel with concealed hinge with polished, chrome-plated finish.
 - c. Bare Piping in Unfinished Service Spaces: One-piece steel with polished, chrome-plated finish or one-piece cast brass with polished, chrome-plated finish.
 - d. Bare Piping in Unfinished Service Spaces: One-piece stamped steel or split-plate, stamped steel with concealed hinge with polished, chrome-plated finish.

3.2 FIELD QUALITY CONTROL

- A. Using new materials, replace broken and damaged escutcheons and floor plates.

END OF SECTION 220518

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, and Section 220000 – General Plumbing Requirements, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Gate Valves.
 - 2. Ball Valves.
 - 3. Check Valves.

1.3 DEFINITIONS

- A. CWP: Non-Shock Cold working pressure.
- B. OS&Y: Outside Stem and Yoke
- C. PTFE: Polytetrafluoroethylene

1.4 SUBMITTALS

- A. See Division 01 and 220000 General HVAC Requirements for submittal procedures and criteria.
- B. Product Data: For each type of valve and service.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Protect internal parts against rust and corrosion.
 - 2. Protect threads, flange faces, grooves, and weld ends.
 - 3. Set angle and globe valves closed to prevent rattling.
- B. Use the following precautions during storage:
 - 1. Maintain valve end protection.
 - 2. Store valves indoors and maintain at higher-than-ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Domestic water piping specialties intended to convey or dispense water for human consumption are to comply with the SDWA, requirements of authorities having jurisdiction, and NSF 61 and NSF 372, or to be certified in compliance with NSF 61 and NSF 372 by an American National Standards Institute (ANSI)-accredited third-party certification body that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.
- B. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- C. Manufacturers: Contractor is responsible for selecting valves that meet requirements as specified.
- D. ASME Compliance:

1. ASME B1.20.1 for threads for threaded-end valves.
 2. ASME B16.1 for flanges on iron valves.
 3. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 4. ASME B16.18 for solder joint.
 5. ASME B31.1 for power piping valves.
 6. ASME B31.9 for building services piping valves.
 - E. Refer to HVAC valve schedule articles for applications of valves.
 - F. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
 - G. Valve Sizes: Same as upstream piping unless otherwise indicated.
 - H. Valves in Insulated Piping: With 2-inch stem extensions.
- 2.2 Domestic Water Systems:
- A. Valves 2 inches and smaller:
 1. Isolation Valves:
 - a. Gate Valves: MSS SP-139, NSF 61-8, NSF 372, 300 PSI CWP, Rising Stem, screw-in bonnet, solid wedge disc. Silicon Bronze body, bonnet, and wedge. Malleable iron hand wheel. Graphite fiber packing. Threaded or Soldered ends.
 - b. Ball Valves: MSS SP-110, NSF 61-8, NSF 372, 600 PSI CWP, lead free, two-piece bronze body, Teflon seats, full port, adjustable stem packing, blowout-proof stems, stainless steel ball, threaded or soldered ends, white handles.
 2. Check Valves: MSS SP-139, NSF 61-8, NSF 372, Y-pattern swing type, 200 PSI CWP, Silicon Bronze body, PTFE seat disc, threaded or soldered ends.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install valve tags. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for valve tags and schedules.

3.3 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

END OF SECTION 220523

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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. Equipment labels.
 - 2. Warning signs and labels.
 - 3. Pipe labels.
 - 4. Stencils.
 - 5. Valve tags.
 - 6. Warning tags.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
- D. Valve numbering scheme.
- E. Valve Schedules: For each piping system to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Metal Labels for Equipment:
 - 1. Material and Thickness: Brass, 0.032-inch stainless steel, 0.025-inch aluminum, 0.032-inch anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
 - 2. Letter Color: Black.
 - 3. Background Color: White.
 - 4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
 - 5. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
 - 6. Fasteners: Stainless-steel rivets or self-tapping screws.
 - 7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.
- C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
- B. Letter Color: Black.
- C. Background Color: Red.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
- G. Fasteners: Stainless-steel rivets or self-tapping screws.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Label Content: Include caution and warning information plus emergency notification instructions.

2.3 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
 - 2. Lettering Size: Size letters according to ASME A13.1 for piping.

2.4 STENCILS

- A. Stencils for Piping:
 - 1. Lettering Size: Size letters according to ASME A13.1 for piping.
 - 2. Identification Paint: Exterior, alkyd enamel or acrylic enamel in colors according to ASME A13.1 unless otherwise indicated. Paint may be in pressurized spray-can form.

2.5 VALVE TAGS

- A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.
 - 1. Tag Material: Brass, 0.032-inch stainless steel, 0.025-inch aluminum, 0.032-inch or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
 - 2. Fasteners: Brass wire-link chain or S-hook.
- B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.
- 2.6 WARNING TAGS
- A. Description: Preprinted or partially preprinted accident-prevention tags of plasticized card stock with matte finish suitable for writing.
 1. Size: 3 by 5-1/4 inches minimum.
 2. Fasteners: Brass grommet and wire.
 3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
 4. Color: Safety yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 GENERAL INSTALLATION REQUIREMENTS

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

3.3 EQUIPMENT LABEL INSTALLATION

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

3.4 PIPE LABEL INSTALLATION

- A. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels, complying with ASME A13.1, with painted, color-coded bands or rectangles on each piping system.
 1. Identification Paint: Use for contrasting background.
 2. Stencil Paint: Use for pipe marking.
- B. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 1. Near each valve and control device.
 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 5. Near major equipment items and other points of origination and termination.
 6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

C. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

D. Pipe Label Color Schedule:

1. Domestic Water Piping

BACKGROUND: SAFETY GREEN.

LETTER COLORS: WHITE.

2. Sanitary Waste and Vent Piping:

BACKGROUND COLOR: SAFETY BLACK.

LETTER COLOR: WHITE.

3.5 VALVE-TAG INSTALLATION

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

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:

COLD WATER: 1-1/2 INCHES, ROUND.

HOT WATER: 1-1/2 INCHES, ROUND.

2. Valve-Tag Colors:

COLD WATER: NATURAL.

HOT WATER: NATURAL.

3. Letter Colors:

COLD WATER: WHITE.

HOT WATER: WHITE.

3.6 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 220553

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PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Piping insulation.
- B. Jackets and accessories.

1.2 SUBMITTALS

- A. See Division 1 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum 3 years of experience.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.5 FIELD CONDITIONS

- A. Maintain ambient conditions required by manufacturers of each product.
- B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

- A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84, NFPA 255, or UL 723.

2.2 GLASS FIBER

- A. Manufacturers:
 - 1. Knauf Insulation.
 - 2. Johns Manville Corporation.
 - 3. Owens Corning Corp.
 - 4. CertainTeed Corporation.

- B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
 - 1. 'K' value: ASTM C177, 0.24 at 75 deg F.
 - 2. Maximum service temperature: 850 deg F.
 - 3. Maximum moisture absorption: 0.2 percent by volume.

- C. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.

- D. Tie Wire: 0.048-inch stainless steel with twisted ends on maximum 12-inch centers.

- E. Vapor Barrier Lap Adhesive: Water based insulation adhesive, UL classified. Compatible with insulation.

2.3 BURIED PIPING INSULATION

- A. Buried Piping Insulation: Closed cell, elastomeric foam pipe insulation. 1 inch thick with self-sealing longitudinal joints. For use on buried piping. ASTM C 534 Type 1 – Tubular Grade 1. Maximum thermal conductivity of 0.25 BTU-in/hr ft² °F in accordance with ASTM C 177. AP Armaflex or approved equal. Provide additional tape to hold seal closed, tape to be suitable for insulation and underground installation.

2.4 JACKETS

- A. PVC Plastic.
 - 1. Manufacturers:
 - a. Johns Manville Corporation.
 - b. Proto/Knauf.
 - c. Speedline.

 - 2. Jacket: One-piece molded type fitting covers and sheet material, off-white color.
 - a. Minimum Service Temperature: 0 deg F.
 - b. Maximum Service Temperature: 150 deg F.

- c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
 - d. Thickness: 10 mil.
 - e. Connections: Brush on welding adhesive.
3. Covering Adhesive Mastic: Compatible with insulation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Exposed Piping: Locate insulation and cover seams in least visible locations.
- D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- E. Glass fiber insulated pipes conveying fluids below ambient temperature:
 - 1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
 - 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- F. For hot piping conveying fluids 140 deg F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- G. Glass fiber insulated pipes conveying fluids above ambient temperature:
 - 1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
 - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

- H. Inserts and Shields:
 - 1. Application: Piping 1-1/2 inches diameter or larger.
 - 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
 - 3. Insert location: Between support shield and piping and under the finish jacket.
 - 4. Insert configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
 - 5. Insert material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.
- I. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions.
- J. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.
- K. Fill joints, cracks, seams, and depressions with cement to form smooth surface.
- L. Finish insulation at supports, protrusions, and interruptions.
- M. Nameplates and ASME Stamps: Bevel and seal insulation around; do not insulate over.
- N. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation so it can be easily removed and replaced without damage.
- O. Factory Insulated Equipment: Do not insulate.
- P. Pipe Exposed (less than 7 feet above finished floor) in Mechanical Equipment Rooms or Finished Spaces: Finish with PVC jacket and fitting covers.

3.3 SCHEDULES

- A. Piping Systems:
 - 1. Domestic Hot, Hot Water Recirc, and Cold Water Supply (Aboveground): Mineral fiber pipe insulation, 1 inch thick. 1/2-inch thick may be used on plumbing piping branches 3/4-inch and smaller diameter when located inside walls.
 - 2. Plumbing Vents Within 10 feet of the Vent Through Roof: Mineral fiber pipe insulation, 1 inch thick.
 - 3. Domestic Cold Water Supply (Underground): Flexible Foam Rubber: 1 inch thick.

END OF SECTION 220719

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PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Pipe, pipe fittings, valves, and connections for piping systems.
 - 1. Sanitary sewer.
 - 2. Domestic water.

1.2 SUBMITTALS

- A. See Division 1 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
- C. Project Record Documents: Record actual locations of valves.

1.3 QUALITY ASSURANCE

- A. Perform work in accordance with applicable codes.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.
- C. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.
- D. Domestic water piping specialties intended to convey or dispense water for human consumption are to comply with the SDWA, requirements of authorities having jurisdiction, and NSF 61 and NSF 372, or to be certified in compliance with NSF 61 and NSF 372 by an American National Standards Institute (ANSI)-accredited third-party certification body that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

- B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.
- D. Store piping and equipment in clean, enclosed from weather, location at all times. Materials are not to be stored in direct contact with dirty surfaces or on dirt floor. If piping, equipment, and components are found to be improperly stored they shall be removed from the project immediately and new, clean materials shall be used.

1.5 FIELD CONDITIONS

- A. Do not install underground piping when bedding is wet or frozen.

PART 2 - PRODUCTS

2.1 SANITARY SEWER, AND VENT PIPING, BURIED WITHIN 5 FEET OF BUILDING

- A. Cast Iron Pipe: ASTM A74 service weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets.

2.2 SANITARY SEWER AND VENT PIPING, ABOVE GRADE

- A. Cast Iron Pipe: CISPI 301, hubless, service weight.
 - 1. Fittings: Cast iron.
 - 2. Joints (Under 3-inch size): CISPI 301, neoprene gaskets and stainless steel clamp-and-shield assemblies. Standard duty.
 - 3. Joints (3-inch and larger): CISPI 301, neoprene gaskets and stainless steel clamp-and-shield assemblies. Heavy Duty Coupling Assembly; Clamp-All or Anoco Husky Series 4000 couplings. No substitutions.
- B. ABS Pipe: ASTM D2751, SDR 23.5, Acrylonitrile-Butadiene-Styrene (ABS) material, bell and spigot style solvent sealed ends.
 - 1. Fittings: ABS, ASTM D2751.
 - 2. Joints: ASTM C564, rubber gasket joint devices.

- C. Copper Tube: ASTM B306, type DWV. Acceptable only on 2-inch and under horizontal waste and vent piping located inside plumbing walls.
 - 1. Fittings: ASME B123, cast bronze, or ASME B129, wrought copper.
 - 2. Joints: ASTM B32, solder, Grade 50B.

2.3 WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

- A. Copper Pipe: ASTM B42, Type K, hard drawn, 1 inch and smaller pipe size may be annealed continuous length, annealed.
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
 - 2. Joints: AWS A5.8, BCuP silver braze.
- B. High-density cross-linked polyethylene tubing manufactured using the PEX-a (Engel/Peroxide) method and with an oxygen diffusion barrier. 1/2-inch to 2-inch diameter. Rated for domestic water.
 - 1. Operating Pressure: 125 psig at maximum 180 deg F.
 - 2. Fittings: Brass flared compression.
 - 3. Joints: Fittings adapt to copper tubing or copper tube fittings, threaded pipe and fittings, and copper compression fittings.

2.4 WATER PIPING, ABOVE GRADE

- A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
 - 2. Joints: ASTM B32, solder, Grade 95TA. Mechanical press fit joint with gasket equivalent to PROGRESS acceptable.
- B. High-density cross-linked polyethylene tubing manufactured using the PEX-a (Engel/Peroxide) method and with an oxygen diffusion barrier. 1/2-inch to 2-inch diameter. Rated for domestic water.
 - 1. Operating Pressure: 125 psig at maximum 180 deg F.
 - 2. Fittings: Brass flared compression.
 - 3. Joints: Fittings adapt to copper tubing or copper tube fittings, threaded pipe and fittings, and copper compression fittings

2.5 FLANGES, UNIONS, AND COUPLINGS

- A. Unions for Pipe Sizes 3 Inches and Under:
 - 1. Ferrous pipe: Class 150 malleable iron threaded unions.
 - 2. Copper tube and pipe: Class 150 bronze unions with soldered joints.
- B. Flanges for Pipe Size Over 1 Inch:
 - 1. Ferrous pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
 - 2. Copper tube and pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.
- C. Dielectric Connections: Union thermoplastic-lined steel construction, water impervious isolation barrier, threaded end or Pro-press type compression fittings. IAMPO/UPC Listed.

2.6 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
 - 1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
 - 2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
 - 3. Trapeze Hangers: Welded steel channel frames attached to structure.
 - 4. Vertical Pipe Support: Steel riser clamp.
 - 5. Floor Supports: Concrete pier or steel pedestal with floor flange; fixture attachment.
- B. Plumbing Piping - Drain, Waste, and Vent:
 - 1. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split type.
 - 2. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
 - 3. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
 - 4. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 - 5. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- C. Plumbing Piping - Water:
 - 1. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split type.

2. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
3. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
4. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
5. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.
6. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- H. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors.
- I. Establish elevations of buried piping outside the building to ensure not less than 5 feet of cover.
- J. Install vent piping penetrating roofed areas to maintain integrity of roof assembly; coordinate with Architectural.
- K. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- L. Provide support for utility meters in accordance with requirements of utility companies.
- M. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.
- N. Install valves with stems upright or horizontal, not inverted.

- O. Install water piping to ASME B31.9.
- P. Install bell and spigot pipe with bell end upstream.
- Q. Sleeve pipes passing through partitions, walls and floors.
- R. Extend vent through roofs (VTR) minimum 18-inches above roof with fabricated flashing and counter flashing as detailed in Architectural.
- S. Piping Tests: All drainage, sanitary waste and vent piping tested hydrostatically by filling piping to highest point for a minimum of one hour. Leaks developed during tests shall be corrected without caulking in threaded piping or additives and test restarted until a perfectly tight system is obtained. Enclosed piping tested before concealing. Tests performed in presence of ARCHITECT.
- T. Piping Tests: All domestic water piping tested hydrostatically at 125 psi for a minimum of one hour. Equipment, gages, and thermometer wells rated for a lesser pressure suitably protected during tests. Leaks developed during tests shall be corrected without caulking in threaded piping or additives and test restarted until a perfectly tight system is obtained. Enclosed piping tested before concealing. Tests performed in presence of ARCHITECT.
- U. Coordinate piping locations closely with other trades.
- V. Where piping penetrates wall, run insulation through penetration. Seal penetration with fire stopping insulation and seal with fire stopping sealant. If sleeve is used as required in concrete penetrations, seal opening between pipe and sleeve with fire stopping insulation and seal with fire stopping sealant. Seal as required by manufacturers UL fire rated assembly listing.
- W. Pipe Hangers and Supports:
 - 1. Install in accordance with ASME B31.9.
 - 2. Support horizontal piping as scheduled.
 - 3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
 - 4. Place hangers within 12 inches of each horizontal elbow.
 - 5. Use hangers with 1-1/2-inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 - 6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
 - 7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 - 8. Provide copper plated hangers and supports for copper piping.
 - 9. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
 - 10. Provide hangers adjacent to motor driven equipment with vibration isolation.
 - 11. Support cast iron drainage piping at every joint.
 - 12. Provide pipe anchors at all elbows and offsets of water service main.
 - 13. All hangers are to be installed on the outside of the insulated piping.

3.4 APPLICATION

- A. Use grooved mechanical couplings and fasteners only in accessible locations.

- B. Install unions downstream of valves and at equipment or apparatus connections.
- C. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- D. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- E. Install ball valves for throttling, bypass, or manual flow control services.

3.5 TOLERANCES

- A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/4 inch per foot slope.

3.6 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Disinfect water distribution system in accordance with Section 2210053.6, and State of Alaska requirements.
- B. Prior to starting work, verify system is complete, flushed and clean.
- C. Ensure pH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- D. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.
- E. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- F. Maintain disinfectant in system for 24 hours.
- G. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- H. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- I. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.7 SCHEDULES

A. Pipe Hanger Spacing:

1. Metal Piping:

a. Pipe size: 1/2 inches to 1-1/4 inches:

- 1) Maximum hanger spacing: 6.5 feet.
- 2) Hanger rod diameter: 3/8 inches.

b. Pipe size: 1-1/2 inches to 2 inches:

- 1) Maximum hanger spacing: 10 feet.
- 2) Hanger rod diameter: 3/8 inch.

- c. Pipe size: 2-1/2 inches to 3 inches:
 - 1) Maximum hanger spacing: 10 feet.
 - 2) Hanger rod diameter: 1/2 inch.

- d. Pipe size: 4 inches to 6 inches:
 - 1) Maximum hanger spacing: 10 feet.
 - 2) Hanger rod diameter: 5/8 inch.

END OF SECTION 221005

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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. Vacuum breakers.
 - 2. Balancing valves.
 - 3. Temperature-actuated, water mixing valves.
 - 4. Strainers for domestic water piping.
 - 5. Water-hammer arresters.
 - 6. Trap-seal primer device.

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

- A. Test and inspection reports.
- B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

- A. Domestic water piping specialties intended to convey or dispense water for human consumption are to comply with the SDWA, requirements of authorities having jurisdiction, and NSF 61 and NSF 372, or to be certified in compliance with NSF 61 and NSF 372 by an American National Standards Institute (ANSI)-

accredited third-party certification body that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

2.2 PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 BALL VALVES

- A. Manufacturers:
 - 1. Tyco Flow Control
 - 2. Conbraco Industries
 - 3. Nibco, Inc
 - 4. Milwaukee Valve Company
- B. Construction, 3 Inches and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze, two piece body, chrome plated brass ball, full port, teflon seats and stuffing box ring, blow-out proof stem, lever handle, solder or threaded ends. Solder ends acceptable only on smaller than 1-inch size. Lead Free.

2.4 ATMOSPHERIC VACUUM BREAKERS

- A. Hose-Connection Vacuum Breakers:
 - 1. Standard: ASSE 1011.
 - 2. Body: Bronze, nonremovable, with automatic draining.
 - 3. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
 - 4. Finish: Chrome or nickel plated.

2.5 ATMOSPHERIC SPILL-RESISTANT PRESSURE VACUUM BREAKERS

- A. Atmospheric Vacuum Breaker: Testable, with isolation test cocks, single float and disc with large atmospheric port. Polished chrome finish with durable silicone disc:
 - 1. Standard: ASSE 1056.
 - 2. Body: Bronze, nonremovable, with automatic draining.
 - 3. Finish: Chrome or nickel plated

2.6 TEMPERATURE-ACTUATED, WATER MIXING VALVES

- A. Water-Temperature Limiting Device for use at Lavatory:
 - 1. Standard: ASSE 1070/ASME A112.1070.
 - 2. Pressure Rating: 230 psig.

3. Type: Thermostatically controlled, engineered polymer piston regulated, water mixing valve for individual faucet supply connection.
4. Material: Polished chrome-plated bronze body with corrosion-resistant interior components.
5. Connections: 3/8-inch OD tube compression inlets and outlet.
6. Accessories: Check stops on hot- and cold-water supplies.
7. Temperature Adjustment: Polished chrome plated cover with concealed spindle with adjustment tool.
8. Tempered-Water Setting: Adjustable from 100 deg F to 120 deg F.
9. Tempered-Water Design Flow Rate: 0.25 gpm minimum to 2.5 gpm maximum.
10. Valve Finish: Polished chrome-plated.
11. Basis of design is HeatGuard HG-135.

2.7 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller.
3. Lead free.
4. End Connections: Threaded for NPS 2 and smaller.
5. Screen: Stainless steel with round perforations unless otherwise indicated.
6. Perforation Size:
 - a. Strainers NPS 2 and Smaller: 0.020 inch.
7. Drain: Factory-installed, hose-end drain valve.

2.8 SWING CHECK VALVES

A. Manufacturers:

1. Hammond Valve.
2. Nibco, Inc.
3. Milwaukee Valve Company.

B. Up to 3 inches:

1. MSS SP-80, Class 125, bronze body and cap, bronze swing disc with rubber seat, threaded ends. 1 inch and smaller valves may have soldered ends. Lead free.

C. Over 3 inches:

1. MSS SP-71, Class 125, iron body, bronze swing disc, renewable disc seal and seat, flanged ends.

2.9 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:

1. Standard: ASSE 1010 or PDI-WH 201.
2. Type: Metal bellows or Piston.
3. Size: ASSE 1010, Sizes PDI-WH 201, Sizes A through F. Provide size indicated on drawings.

2.10 TRAP-SEAL PRIMER DEVICE

A. Mechanical-Type, Automatic Trap-Seal Primer Device:

1. ASSE 1018, Automatic trap priming valve, with diaphragm actuation operating on 10 psi pressure drop or spike in domestic water system, brass construction. Operating range 20 to 80 PSIG. Basis of design is Precision Plumbing Products "Dualflow" CPO-500.
2. Where up to four (4) floor drains are to be served by a single trap primer valve, provide a premanufactured trap primer distribution unit manufactured by the same manufacturer of the trap primer valve.
3. Provide isolation valve, union, and distribution piping to floor drains. Install valve minimum 12" above traps being primed. Mount recessed in wall unless otherwise noted and arranged for easy access to all components.

B. Trap Primer Distribution unit: Premanufactured trap priming distribution system with Copper or PVC body, 1/2 NPS inlet and four brass 3/8 NPS outlet connection.

1. Basis of design is Precision Plumbing Products "DU-4" or "DU-U".
2. Plug unused outlet connections.

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPING SPECIALTIES

A. Temperature-Actuated, Water Mixing Valves: Install with check stops or shutoff valves on inlets and with shutoff valve on outlet.

1. Install surface mounted on wall below lavatory.

B. Y-Pattern Strainers: For water, install on supply side of water meter and tempering valves.

C. Water-Hammer Arresters: Install in water piping in accordance with PDI-WH 201.

- D. Drainage-Type, Trap-Seal Primer Device: Install water closet vacuum tube with outlet piping from distribution unit pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting.

3.2 PIPING CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping specialties adjacent to equipment and machines, allow space for service and maintenance.

3.3 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.

3.4 CONTROL CONNECTIONS

- A. Connect control wiring in accordance with Section 260523 "Control-Voltage Electrical Power Cables."

3.5 ADJUSTING

- A. Set field-adjustable flow set points of balancing valves.
- B. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

3.6 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections.
 - 1. Test each vacuum breaker and trap primer according to authorities having jurisdiction and the device's reference standard.
 - 2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 3. Operational Test: After electrical circuitry has been energized, start units to confirm unit operation.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

- B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.
- A. Prepare test and inspection reports.

END OF SECTION 221119

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. Domestic hot water recirculating pumps.

1.3 DEFINITIONS

- A. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include materials of construction, rated capacities, certified performance curves with operating points plotted on curves, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For domestic water pumps to include in operation and maintenance manuals.

1.6 QUALITY ASSURANCE

- 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. UL Compliance: Comply with UL 778 for motor-operated water pumps.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Retain shipping flange protective covers and protective coatings during storage.
- B. Protect bearings and couplings against damage.
- C. Comply with pump manufacturer's written rigging instructions for handling.

1.8 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1 SMALL WET-ROTOR PUMPS (CP-1 and CP-2)

- A. Basis of Design: Grundfos UPS 15-35 SUC, for standardization
- B. Description: Factory-assembled and -tested, wet-rotor pump. For domestic hot water recirculation. NSF 61. 3 speed pump.
- C. Pump Construction:
 - 1. Body: Stainless steel pump housing, rotor can, and bearing plate.
 - 2. Impeller: Composite.
 - 3. Pump Shaft: Ceramic.
 - 4. Bearings. Double-sintered carbon.
- D. Motor: Three Speed.
 - 1. 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.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in of domestic-water-piping system to verify actual locations of connections before pump installation.

3.2 PUMP INSTALLATION

- A. Comply with HI 1.4.
- B. Install in-line, seal less centrifugal pumps with shaft horizontal unless otherwise indicated.
- C. Install horizontally mounted, in-line, separately coupled or close-coupled centrifugal pumps with shaft(s) horizontal.
- D. Install continuous-thread hanger rods of size required to support pump weight.
 - 1. Comply with requirements for vibration isolation devices specified in Section 220548.13 "Vibration Controls for Plumbing Piping and Equipment." Fabricate brackets or supports as required.

2. Comply with requirements for hangers and supports specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

E. Install thermostats in hot-water return piping.

3.3 CONNECTIONS

A. Comply with requirements for piping specified in Section 221116 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to pumps to allow service and maintenance.

3.4 IDENTIFICATION

A. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment" for identification of pumps.

3.5 ADJUSTING

A. Adjust domestic water pumps to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable switches as indicated.

END OF SECTION 221123

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. Floor Drains.
 - 2. Sediment Interceptors
 - 3. Cleanouts
 - 4. Floor Cleanouts.
 - 5. Wall Cleanouts.
 - 6. Yard Cleanouts.
 - 7. Miscellaneous sanitary drainage piping specialties.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 - 1. Show fabrication and installation details for frost-resistant vent terminals.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTIONS

- A. Sanitary waste piping specialties shall bear label, stamp, or other markings of specified testing agency.

2.2 FLOOR DRAINS

A. Manufactures:

1. Zurn Industries, Inc.
2. Josam Company.
3. J.R. Smith.

- B. Floor Drains: ASME A112.21.1; Type 304 stainless steel, two-piece body with double drainage flange, weep holes, reversible membrane clamping collar, stainless steel sediment bucket, and round, 6-inch adjustable type 304 stainless steel top strainer, vandal proof screws, trap primer connection. Zurn #Z1726-KC-VP-P-Y or approved equal.

2.3 SEDIMENT INTERCEPTORS

A. Manufacturers:

1. J.R. Smith #8810-20-B (basis of design).
2. Josam
3. Zurn

- B. Sediment Trap to be recessed flush with finished floor, fabricated steel with corrosion resistant epoxy coating inside and outside. Cover shall be 24-inch square with 1/4-inch thick diamond plate, recessed lift ring, air-tight gasket with securing screw, integral p-trap with 2-inch cleanout plug. 4-inch inlet and outlet connections, 20-inch square basin.

C. Provide accessories:

1. Removable sediment bucket with lift handle.
2. 3" x 4" pipe increaser on inlet connection by contractor.

2.4 CLEANOUTS

A. Manufacturers:

1. Mifab
2. Josam
3. Zurn

B. Cleanouts at Exterior Surfaced Areas (YCO):

1. Round cast nickel bronze access frame and non-skid cover with vandal proof secured top. Extra-Heavy Duty. Adjustable.

C. Cleanouts at Interior Finished Floor Areas (FCO):

1. Acid-resistant epoxy coated cast iron body with anchor flange, reversible clamping collar, threaded top assembly. Round polished type 304 stainless steel scored cover with gasket, ABS tapered threaded plug.

- D. Cleanouts at Interior Finished Wall Areas (WCO):
 - 1. Line type with galvanized cast iron body and round gasketed cover, and round stainless steel access cover secured with machine screw.
- E. Cleanouts at Interior Unfinished Accessible Areas (WCO):
 - 1. Line type with galvanized cast iron body and tapered thread plug with gasket. Provide bolted stack cleanouts on vertical rainwater leaders

2.5 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

- A. Floor-Drain, Trap-Seal Primer Fittings:
 - 1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
 - 2. Size: Same as floor drain outlet with NPS 1/2 side inlet.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
 - 1. Size same as drainage piping up to NPS 4.
 - 2. Locate at each change in direction of piping greater than 45 degrees or as shown on drawings.
 - 3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller.
- B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- D. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
 - 1. Position floor drains for easy access and maintenance.
 - 2. Set floor drains below elevation of surrounding finished floor to allow floor drainage.
 - 3. Set with grates depressed according to the following drainage area radii:
 - 1. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
 - 2. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
 - 3. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.

4. Install floor-drain flashing collar or flange, so no leakage occurs between drain and adjoining flooring.

1. Maintain integrity of waterproof membranes where penetrated.

E. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

F. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.

1. Exception: Fitting may be omitted if trap has trap-seal primer connection.

2. Size: Same as floor drain inlet.

3.2 PIPING CONNECTIONS

A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment, to allow service and maintenance.

3.3 LABELING AND IDENTIFYING

A. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit.

1. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Propane-fired Water Heaters.
- B. Domestic Water Expansion Tanks.

1.2 SUBMITTALS

- A. See Division 1 - Administrative Requirements, for submittals procedures.
- B. Product Data:
 - 1. Provide data indicating components and connections to other equipment and piping.
 - 2. Provide electrical characteristics and connection requirements.
- C. Manufacturer's Product Shop Drawings:
 - 1. Indicate dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tapings, and drains.
 - 2. Provide specific wiring diagram of electric water heaters. Diagrams shall show all options specific to this project. Do not include options which are not included with water heater provided.
- D. Manufacturer's Instructions.
- E. Project Record Documents: Record actual locations of components.
- F. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.
- G. Maintenance Materials: Furnish the following for OWNER's use in maintenance of project.
 - 1. See Division 1 - Product Requirements, for additional provisions.
 - 2. Provide 2 spare magnesium anode sets for HWG-2.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.4 CERTIFICATIONS

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

- B. Water Heaters: NSF approved.
- C. Domestic Water Expansion Tanks: ASME labeled, to ASME (BPV VIII, 1). NSF approved.
- D. NSF Compliance: Equipment and components that will be in contact with potable water shall be fabricated and labeled to comply with NSF 61 and NSF 372.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.6 WARRANTY

- A. See Division 1 - Closeout Submittals, for additional warranty requirements.
- B. Provide three-year manufacturer warranty for domestic water heaters.
- C. Submit manufacturer warranty and ensure forms have been completed in OWNER's name and registered with manufacturer.

PART 2 - PRODUCTS

2.1 PROPANE-FIRED WATER HEATERS

- A. Manufacturers:
 - 1. A. O. Smith Corporation – BTH-250 is Basis of design.
 - 2. State Manufacturing
 - 3. Rheem Manufacturing Co.
- B. Type: Propane-fired, high-efficiency condensing, power-vented vertical storage tank. Design certified by U.L. Laboratories, Inc. according to ANSI Z21.10.3 standards governing storage type water heaters, meeting the thermal efficiency and standby loss requirements of the U.S. Department of Energy and current edition of ASHRAE/IES 90.1 and complying with SCAQMD Rule 1146.2 and other air quality management districts with similar requirements for low NOx emissions.
- C. Performance:
 - 1. Storage capacity: 100 gallons.
 - 2. BTUH: 250,000.
 - 3. Recovery capacity: 416 gph with 70 deg F temperature rise.
 - 4. Thermal efficiency: 95%
 - 5. Maximum working pressure: 160 psig.
- D. Electrical Characteristics:
 - 1. 120 volts, single phase, 60 Hz., 0.5 Amps.

- E. Construction: Seamless glass-lined tank with glass lining applied to all water-side surfaces after tanks has been assembled and welded. Powered anodes, foam insulation and CSA and ASME rated temperature/pressure relief valve.
- F. Burner: Modulating gas burner that automatically adjusts the input based on demand. Down-fired burner designed for precise mixing of air and gas for optimum efficiency requiring no calibration on start-up.
- G. Controls: Control shall be an integrated solid-state temperature and ignition control device with integral diagnostics, graphic user interface, fault history display, and temperature readout. No-cost remote viewing and fault notification using free app.
- H. Accessories:
 - 1. Condensate neutralizer.
 - 2. ASME rated temperature and pressure relief valve.
 - 3. Thermal expansion tank. See domestic water expansion tank article below.
 - 4. 3" PVC vent pipe per manufacturer's instructions.
 - 5. Seismic bracing/anchoring.
 - 6. Disconnect switch in lockable NEMA 250, type 4X enclosure.

2.2 DIAPHRAGM-TYPE DOMESTIC WATER EXPANSION TANKS (ET-1)

- A. Manufacturers:
 - 1. Amtrol Inc.
 - 2. ITT Bell & Gossett.
 - 3. Taco, Inc.
- B. Construction: Welded steel, ASME rated for working pressure of 125 psig, with flexible EPDM diaphragm sealed into tank. Floor mounted with seismic restraint. For domestic water. NSF rated.
- C. Accessories: Pressure gage and air-charging fitting, tank drain; pre-charge to 55 psig.
- D. Sizes: See Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.
- B. Coordinate with plumbing piping and related electrical Work to achieve operating system.
- C. Install water heaters in accordance with UL requirements.

- D. Secure tanks to concrete pad and wall structure with seismic restraint.
- E. Clean and flush tanks prior to after installation. Seal until pipe connections are made.
- F. Pipe relief valves to floor.
- G. Install combination temperature-and-pressure relief valves in top portion of tank type water heaters. Use relief valves with sensing elements that extend into tanks. Extend commercial-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 or as indicated on drawings.

3.2 DEMONSTRATION AND TRAINING

- A. Demonstrate operation and maintenance procedures.
- B. Provide procedure training for water heater winterization.

END OF SECTION 223000

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Water Closets
- B. Urinals
- C. Lavatories
- D. Drinking Fountains
- E. Bottle Fillers
- F. Showers
- G. Service Sinks
- H. Hose Bibs
- I. Lavatory Insulation Kits

1.2 SUBMITTALS

- A. See Division 1 – Submittal Procedures Requirements, for submittal procedures.
- B. Product Data: Provide catalog illustrations of fixture trim, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- C. Manufacturer's Instructions: Indicate installation methods and procedures.
- D. Maintenance Data: Include fixture trim exploded view and replacement parts lists.
- E. Maintenance Materials: Furnish the following for OWNER's use in maintenance of project.
 - 1. See Division 1 - Product Requirements, for additional provisions.
 - 2. Extra Faucet Washers: One set of each type and size.
 - 3. Extra Lavatory Supply Fittings: One set of each type and size.
 - 4. Extra Toilet Seats: Two of each type and size.
 - 5. Flush Valve Service Kits: One for each type and size.
 - 6. Provide two (2) complete flush valve assemblies for each type of water closet and urinal.
 - 7. Provide two (2) complete faucet assemblies for each type of lavatory.
 - 8. Provide two complete repair kits for each type of water closet and urinal.
 - 9. Provide one spare shower head/glide assembly and one shower valve.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.4 REGULATORY REQUIREMENTS

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Accept fixtures on site in factory packaging. Inspect for damage.
- B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.6 WARRANTY

- A. See Division 1 - Closeout Submittals, for additional warranty requirements.

PART 2 - PRODUCTS

2.1 FLUSH VALVE WATER CLOSETS

- A. Manufacturers:
 - 1. Mansfield 1301 Erie – Basis of Design.
 - 2. Kohler Company
 - 3. Eljer.
 - 4. American Standard Inc.
- B. Bowl: ASME A112.19.2; High Efficiency, wall hung, siphon jet vitreous china closet bowl, with elongated rim, 1-1/2 inch top spud. Coordinate heights requirements with Architectural Documents.
 - 1. WC-1 installed at standard height. Concealed Auto Flush.
 - 2. WC-2 installed at ADA height. Concealed Auto Flush.
- C. Concealed Electronic Flush Valve: Concealed sensor and flushometer with exposed vacuum tube connecting to water closet top spud. Sensor activated water closet flushometer, for wall hung top spud bowls. 1.6 gpf. Infrared sensor with indicator light. Courtesy flush override button. Wheel handle angle stop. Vacuum breaker. Royal 153 ESS-1.6-OR-2-10-3/4-LDIM-HW or approved equal. Hard-wired. Include 120 volt to 24 volt transformer to serve bank of water closets in same room.

- D. Seats:
 - 1. Manufacturers:
 - a. American Standard Inc.
 - b. Beneke Magnolia.
 - c. Bemis Manufacturing Company.
 - d. Church Seat Company.
 - e. Olsonite.
 - 2. Solid white plastic, open front, extended back, self-sustaining hinge, brass bolts, without cover.
- E. Water Closet Carrier:
 - 1. Manufacturers:
 - a. JOSAM Company.
 - b. Zurn Industries, Inc.
 - 2. ASME A112.6.1M; adjustable cast iron frame, integral drain hub and vent, adjustable spud, lugs for floor and wall attachment, threaded fixture studs with nuts and washers suitable for space provided. Vertical units may be nonadjustable.

2.2 WALL HUNG URINALS

- A. Manufacturers:
 - 1. Mansfield Cascade 41 OHE-RS – Basis of Design
 - 2. American Standard Inc.
 - 3. Eljer, Inc.
 - 4. Kohler Company.
- B. Urinals: ASME A112.19.2; vitreous china, wall hung washout urinal with side shields, integral trap, removable stainless steel strainer, 3/4 rear spud, concealed steel supporting carrier hanger. Capable of 0.5 gpf flush volume. ADA approved. U-1 installed at standard height. U-2 installed at ADA height.
- C. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker, stops and accessories.
 - 1. Flush Valve Manufacturers:
 - a. Sloan Valve Company #195 ESS-0.5-DFB-2-10-3/4-LDIM-HW or approved equal.
 - 2. Concealed Electronic Flush Valve: Concealed sensor and flushometer with concealed vacuum tube connecting to urinal rear spud, 0.5 gpf. Hard-wired infrared sensor with indicator light. Wheel handle angle stop. Vacuum breaker. Hard-wired. Include 120 volt to 24 volt transformer to serve bank of urinals in same room.

D. Carriers:

1. Manufacturers:

- a. JOSAM Company.
- b. Zurn Industries, Inc.

2. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded fixture studs for fixture hanger, bearing studs.

2.3 LAVATORIES –WALL HUNG SINGLE BASIN

A. Manufacturers:

1. Mansfield Grand Isle #2018HBNS or approved equal.
2. Kohler Company.
3. Moen model #CA8301.

- B. Vitreous China Wall Hung Basin: ASME A112.19.2M; vitreous china wall hung lavatory 22" x 18-1/8" inch outside dimensions, with 4 inch high back, drillings on 4 inch centers, rectangular basin with splash lip, front overflow, and soap depression.

- C. Supply Fitting: ASME A112.18.1; deck mounted, 4 inch fixed centers infrared sensor activated faucet with trim plate, chrome plated brass combination supply fitting with vandal resistant water economy aerator with maximum 0.5 gpm flow, ADA compliant. 1/2" IPS supply connections. Certified to NSF/ANSI 61, Section 9 to be equal to or less than 0.25% by weighted average lead content.

D. Accessories:

1. Chrome plated 17 gage brass P-trap and arm with escutcheon.
2. Offset waste with perforated open strainer.
3. Screwdriver stops.
4. Rigid supplies.
5. Trap and waste insulated and offset, and water supplies insulated to meet ADA compliance.

- E. Wall Mounted Carrier: ASME A112.6.1; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, concealed arm supports, bearing plate and studs.

- F. For all individual lavatories, or groups of lavatories, provide ASSE-1070 compliant. Hot water tempering valve to supply hot water to the fixture or groups of fixtures. Basis of design is Cash Acme Heatguard HG-135.

2.4 DRINKING FOUNTAIN

A. Manufacturers:

1. Elkay LK4406 – Basis of design.

2. Haws.
 3. Bradley Corp.
- B. Fountain: wall-mounted bi-level drink fountain for ADA and general public. Non-refrigerated, self-contained, surface-mounted, ADA-compliant dual basin with 316 stainless steel basin, heavy-duty vandal resistant designed for exterior installation, marine-grade stainless steel body, vandal-resistant bubbler, automatic stream built-in flow regulator, push buttons on front, mounting bracket. No-lead design meeting NSF/ANSI 61 & 372 requirements. Color selected by Architect.
1. Wall-hung, 18 gage, 304 stainless steel unit with stop valve and trap accessible through bottom cover plate. Rectangular, rounded shape bowls. Integral wall plate.
 2. Chrome-plated vandal-resistant bubbler.
 3. ADA approved self-closing, frontal push pads for fountain.
 4. Integral drain. Integral 3/8" in-line quarter turn Mini-Ball stops.
 5. Inlet strainer.
 6. Bottom plate.
 7. Mounting frame.
 8. Without filter.

2.5 BOTLE FILLERS

1. Elkay LK4405BFFRK – Basis of design.
 2. Haws.
 3. Bradley Corp.
- B. Bottle Filler: Freeze wall-mounted bottle filler for ADA and general public. Non-refrigerated, self-contained, surface-mounted, ADA-compliant heavy-duty vandal resistant designed for exterior installation, marine-grade stainless steel body, automatic stream built-in flow regulator, push buttons on front, mounting bracket. No-lead design meeting NSF/ANSI 61 & 372 requirements. Color selected by Architect.
1. Wall-hung, 18 gage, 304 stainless steel unit with stop valve and trap accessible through bottom cover plate. Rectangular, rounded shape bowls. Integral wall plate.
 2. Laminar-flow dispenser.
 3. ADA approved self-closing, frontal push pads for fountain.
 4. Integral drain. Integral 3/8" in-line quarter turn Mini-Ball stops.
 5. Inlet strainer.
 6. Bottom plate.
 7. Mounting frame.
 8. Without filter.

2.6 SHOWERS

- A. Shower Enclosure: Shower walls to be built-in place per architectural. Shower base to be one-piece acrylic construction, nominally 32-1/4" x 62-1/2" roll-in shower manufactured of applied acrylic shower pan. Shower pan be provided

with pitching to center drain and have a matt finish for slip resistance. Shower pan shall have a maximum ½ inch lip measured from top of threshold to interior floor for ADA wheelchair access, with integral drain fixture and grate centered in shower pan. Shower walls shall be provided by architectural with reinforcing for grab bars and fold-down seat according to FHA accessibility requirements. Shower shall be provided with fold-down seat per architectural with reinforcing. Provide grab bars and fold-down seat on either left-hand or right-hand per plans. Shower bases shall be provided from the same manufacturer, Freedom Showers model APF6232BFPANC or approved equal.

- B. Trim: ASME A112.18.1; ADA compliant concealed shower supply with pressure balanced mixing valves, integral service stops, bent shower arm with adjustable spray ball joint shower head with maximum 1.5 gpm flow, and escutcheon, with hand held shower with in-line vacuum breaker, lever diverter valve with integral volume control, 72 inch metal clad hose and 24 inch slide bar, chrome brass escutcheon on valve. Basis of design is Moen M-Dura Commercial Three-Function Shower System model T9342BBM15 with Posi-temp rough-in valve with integral stops and #3360 3-function transfer rough-in valve, or approved equal.
- C. Showers shall be set in a 4” recessed pit or with depth as required to maintain lip of shower basin even with adjacent floor level for ADA compliance.

2.7 SERVICE SINKS

- A. Manufacturers:
 - 1. Mustee Model 63M - Design of design.
 - 2. Kohler Company
 - 3. Elkay Manufacturing Company.
 - 4. Just Manufacturing Company.
 - 5. American Standard.
- B. Bowl: Floor-mounted: 24 x 24 x 10-inch-high, high-impact resistant molded structural fiberglass “Durastone”, colorfast marbled finish.
- C. Trim: ASME A112.18.1 exposed wall type supply with lever handles, spout wall brace, vacuum breaker, hose end spout, strainers, eccentric adjustable inlets, integral screwdriver stops with covering caps and adjustable threaded wall flanges. Moen #8124 or approved equal.
- D. Accessories:
 - 1. 5 feet of 1/2 inch diameter plain end reinforced plastic hose.
 - 2. Hose clamp hanger.
 - 3. Mop hanger.
 - 4. Pail hook.
 - 5. Provide minimum of 24-inch-high and length-of-fixture stainless steel wall guard at the two sides.

2.8 HOSE BIBS

- A. Manufacturers:
 - 1. JR Smith.
 - 2. Woodford.
 - 3. Watts.
 - 4. Substitutions: Section 016000 - Product Requirements
- B. Interior Wash-down Hose Bib: ASSE 1011, Recessed wall mounted wall box with lockable cover, replaceable 304 stainless steel door and fascia, cylinder lock, self-draining type with chrome plated wall plate hose thread spout, hardened stainless steel stem, polycarbonate wheel handle and removable tee key and integral vacuum breaker in conformance with ASSE 1011, with integral water supply stop. Woodford model MB224 or approved equal.
- C. Exterior Freeze Proof Hose Bib: ASSE 1019-B; non-freeze, self-draining type with chrome plated wall plate hose thread spout, hardened stainless steel stem, removable key and integral vacuum breaker in conformance with ASSE 1011, with valve extensions sized to place the valve body in the warm side of insulation. Woodford model B65 or approved equal.

2.9 LAVATORY INSULATION KITS

- A. Manufacturers:
 - 1. Basis of Design: Truebro, Inc. "Lav Guard2" Series.
 - 2. Plumberex
 - 3. Substitutions: Section 016000 - Product Requirements.
- B. Product Description: Where Lavatories or sinks are noted to be insulated for ADA compliance, furnish the following: Safety Covers conforming to ANSI A177.1 and consisting of insulation kit of molded closed cell vinyl construction, 3/16 inch thick, white color, for insulating tailpiece, P-trap, hot and cold water supply valves, and supply piping. Furnish with weep hole and angle valve access covers.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- B. Verify dimension of all custom sized fixtures before ordering.
- C. Confirm that millwork is constructed with adequate provision for the installation of countertop sinks.
- D. See Architectural documents for all mounting heights.
- E. Coordinate with Architectural and General Contractor for framing and reinforcing requirements of fixtures.

- F. Verify that electric power is available and of the correct characteristics.

3.2 PREPARATION

- A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.
- B. Coordinate electrical requirements for plumbing equipment.
- C. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.3 INSTALLATION

- A. Install Work in accordance with State standards.
- B. Install each fixture with chrome-plated trap, easily removable for servicing and cleaning.
- C. Provide chrome plated rigid or flexible supplies to fixtures with screwdriver stops, reducers, and escutcheons.
- D. Install components level and plumb.
- E. Install and secure fixtures in place with wall supports and bolts with sufficient strength to prevent movement of fixture when subjected to a force of 200 pounds in any direction.
- F. Seal fixtures to wall and floor surfaces with sealant as specified in Division 7, color to match fixture. Sealant shall have a convex bead in order to prevent water from accumulating on the finished surface.
- G. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.
- H. All supply piping to fixture anchored to wall.
- I. All sink supply spouts with aerators.
- J. Stops installed in each supply pipe at each fixture, accessibly located. Exposed stops of the loose key type, unless quarter turn Mini-Ball stop or screwdriver type is specified, with threaded chrome-plated brass nipple and escutcheon. Where stops are not specified with the fixture, standard globe or angle valves shall be used, located in accessible, concealed space such as cabinetwork, pipe spaces, or unfinished rooms.
- K. Suitable protective cover placed over fixtures immediately after installation. Damaged fixtures replaced at no additional cost to the OWNER.

3.4 INTERFACE WITH WORK OF OTHER SECTIONS

- A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.5 ADJUSTING

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.
- B. Verify in writing that main thermostatic mixing valves have been set to provide 115 deg F as scheduled.
- C. Verify in wiring that lavatory mixing valves have been set to provide 105 deg F. Verify in writing that shower limits have been set.

3.6 MATERIALS

- A. Provide tools and extra materials required for maintenance of installed equipment as follows:
 - 1. Furnish two loose keys for outside hose bibs.
 - 2. Furnish two sets of faucet washers, flush valve service kits, and lavatory supply fittings.
 - 3. Furnish two sets of water closet flush valve assemblies.

3.7 CLEANING

- A. Clean plumbing fixtures and equipment.

3.8 PROTECTION

- A. Protect installed products from damage due to subsequent construction operations.
- B. Do not permit use of fixtures by construction personnel.
- C. Repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 224000

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 01 apply to this Section. Basic HVAC Requirements are specifically applicable to Divisions 23 Sections as delineated in these specifications.

1.2 SUMMARY

- A. Furnish labor, materials, equipment, supervision of labor and performance of operations required to completely install satisfactorily operating mechanical systems as defined herein and on Drawings.
- B. Major items of work include, but are not limited to, the installation of equipment and materials specified in this Division and/or the drawings:
 - 1. Heating and ventilation systems.
 - 2. Plumbing systems.
- C. For additional details, refer to Drawings detailing work under other Divisions. Work shown on the Drawings and 230000 series Specifications is to be provided unless otherwise stated.

1.3 COORDINATION

- A. The Drawings and Specifications are complementary to each other. What is shown on one is as binding as if called for in both. In the event of conflicting information in the Contract Documents, notify the Owner's Representative in writing immediately for clarification.
- B. Submit in writing to the Owner's Representative for review details of necessary or proposed departures from these Contract Documents and reasons therefore, as soon as practicable within 30 days after the award of the contract. Make no such departure without prior written approval of the Owner's Representative. Deviations from these Contract Documents require engineer support and shop drawings needed to be provided by the Contractor at the discretion of the Owner's Representative.
- C. The mechanical Drawings are generally diagrammatic and are intended to show mechanical details in a schematic fashion.
- D. Do not scale mechanical Drawings. Exact locations are not shown unless so indicated or specifically dimensioned.
- E. Typical connection diagrams are schematic and do not show the actual physical arrangement of equipment.

- F. The plans do not necessarily show complete details of features that may affect the mechanical installations; however, it is the intent of the contract documents to provide a complete and satisfactorily working installation.
- G. Coordination of the Work: Coordinate work under this Division with work of other trades to avoid conflicts, errors, and delays.
- H. Verify the approximate location of equipment and other mechanical system components shown on the Drawings and report any conflicts with openings, structural members, and components of other systems and equipment having fixed locations.

1.4 SCHEDULE

- A. During the course of accomplishing the work defined herein and on the Contract Drawings, the Contractor discovers major damage, defect or deterioration to existing equipment or systems indicated as existing to remain, and where such damage, defect or deterioration will or might affect the safe and proper operation of such equipment and systems, the Contractor shall immediately notify the Owner's Representative in writing. Contractor shall coordinate their work schedule with the other Contractors and the Owner according to Division 01, ensuring work is completed on time.
- B. Sequencing and Scheduling: Coordinate the scheduling of equipment and material installations with other trades to avoid conflicts. If, during the course of construction, conditions are discovered which adversely affect the mechanical work, immediately notify the Owner's Representative before proceeding. Advise other trades of openings required in their work for the subsequent installation of mechanical work or equipment.
- C. Contractor shall work with the Owner and other Contractors to minimize building service interruptions, for both duration and frequency. Service interruptions will require 14 days notice to the Owner or as directed by Division 01. Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated.

1.5 REFERENCES

- A. Codes and Standards: Work and materials shall comply with the latest issues of the following:
 - 1. American Gas Association (AGA).
 - 2. Air Moving and Conditioning Association (AMCA).
 - 3. American National Standards Institute (ANSI).
 - 4. Air-Conditioning and Refrigeration Institute (ARI).
 - 5. American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE).
 - 6. American Society of Mechanical Engineers (ASME).
 - 7. American Society for Testing Materials (ASTM).
 - 8. American Water Works Association (AWWA).
 - 9. American Welding Society (AWS).
 - 10. Environmental Protection Agency (EPA).
 - 11. Hydraulic Institute (HI).
 - 12. International Building Code (IBC).

13. International Fire Code (IFC).
14. International Fuel Gas Code (IFGC)
15. International Mechanical Code (IMC).
16. National Bureau of Standards (NBS).
17. National Environmental Balancing Bureau (NEBB).
18. National Electrical Code (NEC).
19. National Electrical Manufacturers Association (NEMA).
20. National Fire Protection Association (NFPA).
21. Occupational Safety and Health Administration (OSHA).
22. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).
23. Underwriters Laboratories, Inc. (UL).
24. Uniform Plumbing Code (UPC).
25. All base materials shall comply with standards of ASTM and ANSI.

1.6 QUALITY ASSURANCE

- A. Work and materials shall be in accordance with applicable codes, standards and ordinances, rules and regulations of the Fire Marshal and of the utility companies. Nothing in the Drawings and Specifications shall be construed as requiring or permitting work in violation of such codes.
- B. Rulings and interpretations of the agencies having jurisdiction shall be considered as part of the codes and regulations if commonly known to the trade prior to bidding.
- C. Whenever the Drawings and Specifications require higher standards than the codes and regulations, the Drawings and Specifications shall govern.
- D. Only craftsmen skilled in their trade shall be employed. Workers shall have a minimum documented sheet metal fabrication and installation experience in commercial or industrial facilities of three years or be enrolled in an Alaska Department of Labor approved Apprentice program. The ratio of on-site workers shall not exceed three apprentices or workers for every one foreman. A foreman is defined as a worker with a minimum of three years' experience as detailed above or is an approved Journeyman.
- E. Fan Requirements:
 1. Performance Ratings: Conform to AMCA 210 and bear AMCA Certified Rating Seal.
 2. Sound Ratings: AMCA 301, tested to AMCA 300 and bear AMCA Certified Sound Rating Seal.
 3. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.
 4. Balance Quality: Conform to AMCA 204.

1.7 QUALIFICATIONS

- A. Manufacturers: Company specializing in manufacturing products specified in subsequent sections shall have a minimum three years of experience.
- B. Installers: Company specializing in performing Work of this section with a minimum three years of experience.

1.8 SUBMITTALS

- A. Submit shop drawings, product data, material data sheets, manufacturers' literature, and items as specified in Division 01 and the individual sections of Division 23. Incomplete or partial Division 23 submittals will be returned without review.
- B. Coordination Drawings: Provide coordination drawings if required for space coordination issues.

1.9 CLOSEOUT SUBMITTALS

- A. Submit required certifications and testing reports.
- B. Operating and Maintenance Data.
- C. Submit mechanical HVAC system start-up, testing, and demonstration plans.
- D. Submit a mechanical system operating instruction training schedule complete with class outline lesson plan that includes training topics and durations.
- E. Project Record Documents: Record actual locations of components and tag numbering.

1.10 PROJECT CONDITIONS

- A. Site Visit: It is advised that the Contractor visit the site and verify the exact conditions relating to their work and obtain such information as may be necessary to provide an intelligent and conclusive bid. No allowance will be made on behalf of the Contractor for any extra expense due to failure on their part to make such a visit.
- B. Protection: Protect surrounding areas and surfaces to preclude damage due to the installation of material or equipment. Unfinished work shall be temporarily protected from unsafe conditions and damage.
- C. Relocate existing equipment to accommodate the project work.
- D. Contractor shall verify field measurements prior to fabrication. No allowance will be made on behalf of the Contractor for extra expense due to failure to verify field measurements.

1.11 INSPECTION

- A. Work and materials shall be subject to inspection by the Owner and by the agencies having jurisdiction.
- B. Work or materials found to be damaged or defective or not conforming to the requirements of the Drawings or Specifications, or to the approved finish aesthetic appearance of the job, shall be removed and replaced as directed by the Owner.
- C. Notify the Engineer one week prior to inspections.

1.12 ELECTRICAL REQUIREMENTS

- A. Electrical work, equipment, wiring, devices, and components shall comply with the requirements of local and national electrical codes and with Division 24, 25, 26, 27, and 28.
- B. Electrical equipment, devices, and components that are tested by Underwriters Laboratories, Inc. shall be UL listed and shall bear a UL label.
- C. Factory wired assemblies and panels shall be prewired to numbered terminal strips for connection to field wiring.

1.13 USE OF HEATING SYSTEMS DURING CONSTRUCTION

- A. The Contractor shall not use the heating system for temporary means or construction means. Contractor shall provide temporary means for heating as required for construction.
- B. Permanent air handling units and other fan systems may not be used during construction without approval from the Owner's Representative.

1.14 GUARANTEE

- A. Neither the final certificate of payment, nor provisions in the Contract Documents, nor partial or entire occupancy of the premises by the Owner shall constitute an acceptance of work not done in accordance with the Contract Documents or relieve the Contractor of liability in respect to express warranties or responsibilities for faulty materials or workmanship.
- B. The Contractor shall remedy defects in the work and pay for damage to other work resulting therefrom which shall appear within a period one year from the date of final acceptance of work, unless a longer period is specified. The Owner's Representative will give notice of observed defects with reasonable promptness.

1.15 OPERATING AND MAINTENANCE DATA

- A. The Contractor shall prepare operating and maintenance instructions containing information to operate, prolong service life or replace parts of the work. Operating and maintenance data shall specifically include:
 - 1. List of contractors' and subcontractors' names, addresses, and telephone numbers.
 - 2. List of equipment and material manufacturers' local representatives and suppliers and their addresses and telephone numbers.
 - 3. Pipe and duct identification schedules.
 - 4. Nameplate directory with a list of equipment indicating designation, location of equipment, manufacturers' name, model number, serial number, electrical characteristics, primary control switch location and normal position of switch.
 - 5. Valve directory indicating valve number, size, location, function, service, type, and normal position.
 - 6. Air test and balance report.

- B. Equipment Literature: Provide the following for equipment, fixtures, devices, valves, and specialties:
1. Manufacturer's data sheets and cut sheets.
 2. Model and serial numbers.
 3. Capacity curves, charts, and calculations.
 4. Electrical characteristics.
 5. Replacement parts list.
 6. As-built equipment piping diagrams.
 7. As-built equipment wiring diagrams.
 8. Manufacturer's instructions for operation and maintenance.
 9. Completely mark out on literature sheets non-applicable items.
 10. Where piping and wiring diagrams are not available from the manufacturer, they shall be produced by the Contractor.
 11. Literature shall be grouped together by system, i.e., plumbing, heat generation, etc. For each system section, the Contractor shall produce and include a basic system written narrative description. Each narrative shall be comprised of the following:
 - a. Brief system description, including sequence of operation.
 - b. Basic system function discussion, including any interaction with other systems or components.
 - c. Primary system preventive maintenance procedures.
 - d. How to isolate major components.
 - e. Emergency shutdown procedures.
- C. Master Maintenance Schedule: List each item of equipment requiring inspection and maintenance, showing component maintenance required and the intervals when such inspection and maintenance shall be performed (daily, weekly, monthly, semi-annually, etc.). For each item, reference the page within the maintenance manual where detailed manufacturer's maintenance instructions can be found.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Materials and equipment shall be those of major and reputable manufacturers with ability to render competent and thorough service through local organizations and expeditiously to provide spare parts.
- B. In addition to material and equipment specified, also provide incidental materials required to effect complete installation. Such incidental materials include solders, tapes, caulking, mastics, gaskets, etc.
- C. Mixes, Compounds, Dopes, Tapes and Fluxes: Mixes, compounds, dopes, tapes, and fluxes shall be fresh, highest quality, free of contaminants, of the type and grade suitable for the intended use in each case. Where more than one type of mix, etc. is specified for the same service, select one type; however, state which type is proposed for use in the submittal material and in no case more than one type is to be used in a specific mechanical system. Where two or more units of the same mix, etc., are required, provide products of a single manufacturer. Provide mixes, etc., bearing

approval stamps wherever standards have been established. Comply with governing regulations and industry standards for selections, and with manufacturers' recommendations where applicable.

- D. Valves, piping specialties, and escutcheons and access panels to be of same manufacturer throughout installation even though they may be specified in different Divisions of these specifications.
- E. Materials and equipment shall be free of asbestos. Mixes, fluxes, and solders shall be free of lead. Submit certification that no asbestos or lead based materials have been used or installed.

2.2 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Materials shall be new, unused, and delivered to the job site packed in their original containers.
- B. Materials shall be delivered free of damage or defects.
- C. Provide adequate storage facilities at the job site to protect materials from damage or corrosion.
- D. Protect material, equipment, and apparatus provided under this Division from damage, water, dust, etc., both in storage and installed until final completion has been filed. Materials, equipment, or apparatus damaged because of improper storage or protection will be rejected and must be removed from site.
- E. Piping, ductwork, and similar equipment shall be capped or protected during storage and installation to protect from construction debris and dust contamination.

PART 3 - EXECUTION

3.1 PREPARATION

- A. The Contractor shall lay out Work in advance of construction and shall determine the correct location and placement of material and equipment.
- B. Schedule work in coordination with that of other trades in order to avoid delays in construction and unnecessary cutting and patching.

3.2 INSTALLATION

- A. Work shall be installed neatly and in accordance with the best practices in the trade.
- B. Workmanship must be of highest quality, done by persons especially skilled at assigned tasks, resulting in neat, clean, and well-done installations consistent with best practices of trades.
- C. Repair or replace materials and parts on premises that become damaged as a result of installation of work of this Division to the satisfaction of the Owner. Remove replaced parts from the premises.

- D. Ensure installation is performed per the manufacturer's instructions.

3.3 START-UP / DEMONSTRATION (as specified in Division 01)

- A. Provide the services of a factory trained technician for the start-up and testing of the following equipment:
 - 1. Heating Systems
 - 2. Exhaust Systems.
- B. Prepare and submit complete start-up testing and demonstration plans 30 days prior to scheduled test, start-up, or demonstration date. Mechanical systems shall be demonstrated for proper operation. The demonstration plan shall clearly identify each system and piece of equipment and the proposed demonstration.
- C. Following successful testing and start-up, submit certifications that the equipment and/or systems are operating properly.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 01 Specification Sections, and Section 230000 – General HVAC Requirements, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Metal pipe hangers and supports.
 - 2. Trapeze pipe hangers.
 - 3. Metal framing systems.
 - 4. Fastener systems.
 - 5. Pipe stands.
 - 6. Equipment supports.

1.3 SUBMITTALS

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

PART 2 - PRODUCTS

2.1 HANGARS PLACED IN DIRECT CONTACT WITH PIPE (NON-INSULATED HANGAR)

- A. Copper Pipe:
 - 1. 2 inch and smaller: Adjustable swivel loop style, MSS SP-58, copper-coated-steel, factory-fabricated components.
 - 2. 2-1/2 inch and larger: Adjustable clevis hangar style, MSS SP-58, copper-coated-steel, factory-fabricated components.
- B. Steel Pipe:
 - 1. 2 inch and smaller: Adjustable steel swivel ring (band type) hanger
 - 2. 2-1/2 inch and larger: Adjustable, Clevis Hangers, Steel, (MSS SP-58 Type 1).
- C. Galvanized Steel Pipe:
 - 1. 2 inch and smaller:
 - 2. 2-1/2 inch and larger:

2.2 HANGARS PLACED AROUND CONTINUOUSLY INSULATED PIPE (INSULATED HANGAR)

- A. All Piping:
 - 1. 2 inch and smaller: adjustable steel clevis with galvanized sheet metal shield
 - 2. 2-1/2 inch and larger: Adjustable, Clevis Hangers, Steel, (MSS SP-58 Type 1) with non-conductive pipe saddle support, or galvanized sheet metal shield
- B. Riser Clamps
 - 1. Non-Insulated Pipe: pipe clamps with weldless eye nuts
 - 2. Insulated Pipe (above ambient service): pipe clamps with weldless eye nuts or double bolted pipe clamps
 - 3. Insulated Pipe (below ambient service or dual-temp service): double bolted pipe clamps

2.3 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
 - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 - 2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
 - 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
 - 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 - 5. Hanger Rods: Continuous-thread rod, nuts, and washer made of **carbon steel**, coated with corrosion resistant coating.
- B. Copper Pipe Hangers:
 - 1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
 - 2. Hanger Rods: Continuous-thread rod, nuts, and washer made of **carbon steel**, coated with corrosion resistant coating.

2.4 TRAPEZE PIPE HANGERS

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

2.5 HANGERS AND SUPPORTS FOR DUCTS

- A. Hanger Rods: Stainless steel rods with threads painted with zinc-chromate primer after installation.
- B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," **Table 5-1**, "Rectangular Duct Hangers Minimum Size," and **Table 5-2**, "Minimum Hanger Sizes for Round Duct."

- C. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- D. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- E. Trapeze and Riser Supports:
 - 1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

2.6 PIPE STANDS

- A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.
- B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.
- C. Low-Type, Single-Pipe Stand: One-piece **plastic** or **stainless-steel** base unit with plastic roller, for roof installation without membrane penetration.

2.7 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.8 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
 - 2. Design Mix: **5000-psi (34.5-MPa)**, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
 - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
 - 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Fastener System Installation:
 - 1. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- D. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- E. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- F. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- G. Install lateral bracing with pipe hangers and supports to prevent swaying.
- H. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- I. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- J. Insulated Piping:
 - 1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
 - 2. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.
 - 3. 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 (305 mm) long and 0.048 inch (1.22 mm) thick.
 - b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
4. Pipes **NPS 8 (DN 200)** and Larger: Include reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
 5. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 HANGER AND SUPPORT INSTALLATION FOR DUCTS

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Building Attachments: Structural-steel fasteners appropriate for construction materials to which hangers are being attached.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," **Table 5-1**, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within **24 inches** of each elbow and within **48 inches** of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum interval of **16 feet**.
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.3 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

3.4 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 (40 mm)**.

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

- A. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- B. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- C. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- D. Use carbon-steel pipe hangers and supports, metal trapeze pipe hangers, and metal framing systems and attachments for general service applications.
- E. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.
- F. Use padded hangers for piping that is subject to scratching.
- G. 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 (DN 15 to DN 750).
 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F (566 deg C), pipes NPS 4 to NPS 24 (DN 100 to DN 600), requiring up to 4 inches (100 mm) of insulation.
 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36 (DN 20 to DN 900), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
 4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 (DN 15 to DN 600) if little or no insulation is required.
 5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4 (DN 15 to DN 100), 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 (DN 20 to DN 200).
 7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
 8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
 9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
 10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8 (DN 10 to DN 200).

11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes **NPS 3/8 to NPS 3 (DN 10 to DN 80)**.
 12. U-Bolts (MSS Type 24): For support of heavy pipes **NPS 1/2 to NPS 30 (DN 15 to DN 750)**.
 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 (DN 100 to DN 900)**, 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 (DN 100 to DN 900)**, 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 (DN 65 to DN 900)** 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 (DN 25 to DN 750)**, from two rods if longitudinal movement caused by expansion and contraction might occur.
- H. 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 (DN 24 to DN 600)**.
 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers **NPS 3/4 to NPS 24 (DN 20 to DN 600)** if longer ends are required for riser clamps.
- I. 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.

END OF SECTION 230529

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Equipment labels.
 - 2. Duct labels.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Plastic Labels for Equipment:
 - 1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
 - 2. Letter Color: White.
 - 3. Background Color: Black.
 - 4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
 - 5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
 - 6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
 - 7. Fasteners: Stainless-steel.
 - 8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.
- C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.

- B. Locate equipment labels where accessible and visible.

END OF SECTION 230553

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Testing, adjustment, and balancing of air systems.

1.2 REFERENCE STANDARDS

- A. AABC MN-1 - AABC National Standards for Total System Balance; Associated Air Balance Council; 2002.
- B. ASHRAE Std 111 - Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 1988, with 1997 Errata.
- C. NEBB (TAB) - Procedural Standards for Testing Adjusting Balancing of Environmental Systems; National Environmental Balancing Bureau; 2005, Seventh Edition.
- D. SMACNA (TAB) - HVAC Systems Testing, Adjusting, and Balancing; Sheet Metal and Air Conditioning Contractors' National Association; 2002.

1.3 SUMMARY

- A. Scope of Work: Adjust and balance all building air systems. Air volumes are shown on the floor plans. Coordinate with contract document requirements.
 - 1. Ventilation and Exhaust Systems:
 - a. Exhaust and Make-up air System
 - b. Duct Branches, Diffusers, and Grilles.
 - 2. Air Inlets and Outlets
 - 3. Assistance with control calibration assistance (sensors, etc) for exhaust system operation.

1.4 SUBMITTALS

- A. See Division 1 Submittal Procedures.
- B. Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.
- C. Field Logs: Submit logs to Engineer and Commissioning Authority.
- D. Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.

- E. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
 - 1. Revise TAB plan to reflect actual procedures and submit as part of final report.
 - 2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Engineer and for inclusion in operating and maintenance manuals.
 - 3. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
 - 4. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
 - 5. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
 - 6. Units of Measure: Report data in both I-P (inch-pound) units.
 - 7. Include the following on the title page of each report:
 - a. Name of Testing, Adjusting, and Balancing Agency.
 - b. Address of Testing, Adjusting, and Balancing Agency.
 - c. Telephone number of Testing, Adjusting, and Balancing Agency.
 - d. Project name.
 - e. Project location.
 - f. Owner.
 - g. Project Engineer.
 - h. Project CONTRACTOR.
 - i. Project altitude.
 - j. Report date.
- F. Project Record Documents: Record actual locations of flow measuring stations and balancing valves and setting.
- G. Reports. Provide all reports as indicated in 230593 3.8.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Perform total system balance in accordance with one of the following:
 - 1. AABC MN-1, AABC National Standards for Total System Balance.
 - 2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
 - 3. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.

4. SMACNA HVAC Systems Testing, Adjusting, and Balancing.
 5. Maintain at least one copy of the standard to be used at project site at all times.
- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
- C. TAB Agency Qualifications:
1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
 2. Having minimum of three years documented experience.
 3. Certified by one of the following:
 - a. AABC, Associated Air Balance Council: www.aabchq.com; upon completion submit AABC National Performance Guaranty.
 - b. NEBB, National Environmental Balancing Bureau: www.nebb.org.
 - c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org.
 - d. Professional mechanical engineer with documented TAB experience within the last five years.
- D. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.2 EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
1. Systems are started and operating in a safe and normal condition.
 2. Temperature control systems are installed complete and operable.
 3. Proper thermal overload protection is in place for electrical equipment.
 4. Filters have been replaced immediately prior to adjustment of air system.
 5. Duct systems are clean of debris.
 6. Fans are rotating correctly.
 7. Volume dampers are in place and open.
 8. Access doors are closed and duct end caps are in place.
 9. Air outlets are installed and connected.
 10. Duct system leakage is minimized.
- B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.
- C. Beginning of work means acceptance of existing conditions.

3.3 ADJUSTMENT TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.
- B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.
- C. Duct traverses at the supply fan outlets and at the exhaust fan inlets shall be compared to total grille and diffuser airflows for each fan unit to determine the percentage duct leakage. Coordinate with Sheet Metal contractor.

3.4 RECORDING AND ADJUSTING

- A. Field Logs: Maintain written logs including:
 - 1. Running log of events and issues.
 - 2. Discrepancies, deficient or uncompleted work by others.
 - 3. Contract interpretation requests.
 - 4. Lists of completed tests.
- B. Ensure recorded data represents actual measured or observed conditions.
- C. Permanently mark settings of dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- D. Mark on the drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.
- E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- G. Adjust diffuser and grille blades for proper air diffusion throughout. Adjust horizontal to vertical projection cones for proper air diffusion for round diffusers.
- H. Duct traverses at the supply fan outlets and at the return/exhaust fan inlets shall be compared to total grille and diffuser airflows for each fan unit to determine the percentage duct leakage.

3.5 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.
- B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

- C. Measure air quantities at air inlets and outlets.
- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- E. Use volume control devices to regulate air quantities only to extent that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
- F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
- G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- H. Adjust dampers for design conditions.
- J. EF Adjustment: Perform in the following sequence.
 - 1. Achieve the design flow rates for all outlets.
 - a. EF: Balancing dampers in the longest run wide open.

3.7 SCOPE

- A. Test, adjust, and balance the following:
 - 1. Ventilation and Exhaust Systems:
 - a. EF-1, EF-2 Systems, Make-up air
 - b. Duct Branches, Diffusers, and Grilles.
 - 2. Control calibration assistance (sensors, etc).

3.8 MINIMUM DATA TO BE REPORTED

- A. Electric Motors:
 - 1. Manufacturer
 - 2. Model/Frame
 - 3. HP/BHP
 - 4. Phase, voltage, amperage; nameplate, actual, no load
 - 5. RPM
 - 6. Service factor
 - 7. Starter size, rating, heater elements
 - 8. Sheave Make/Size/Bore

B. Exhaust Fans:

1. Location
2. Manufacturer
3. Model number
4. Serial number
5. Air flow, specified and actual
6. Total static pressure (total external), specified and actual
7. Inlet pressure
8. Discharge pressure
9. Sheave Make/Size/Bore
10. Number of Belts/Make/Size
11. Fan RPM

C. Duct Traverses:

1. System zone/branch
2. Duct size
3. Area
4. Design velocity
5. Design air flow
6. Test velocity
7. Test air flow
8. Duct static pressure
9. Air temperature

D. Air Distribution:

1. Room number/location
2. Diffuser/Grille Type
3. Number
4. Size
5. Area factor
6. Design velocity if applicable
7. Design air flow
8. Test (final) velocity
9. Test (final) air flow
10. Percent of design air flow

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Duct insulation.

1.2 SUBMITTALS

- A. See Division 1 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- C. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of experience and approved by manufacturer.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.5 FIELD CONDITIONS

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
- B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

- A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84, NFPA 255, or UL 723.

2.2 GLASS FIBER, FLEXIBLE

- A. Manufacturer:
 - 1. Knauf Insulation.
 - 2. Johns Manville Corporation.
 - 3. Owens Corning Corp.
 - 4. CertainTeed Corporation.
- B. Insulation: ASTM C553; flexible, noncombustible blanket.
 - 1. 'K' value: 0.36 at 75 degrees F, when tested in accordance with ASTM C518.
 - 2. Maximum Service Temperature: 1200 degrees F.
 - 3. Maximum Water Vapor Sorption: 5.0 percent by weight.
- C. Vapor Barrier Jacket:
 - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
 - 2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
 - 3. Secure with pressure sensitive tape.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that ducts have been tested before applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Insulated ducts conveying air below ambient temperature:

1. Provide insulation with vapor barrier jackets.
2. Finish with tape and vapor barrier jacket.
3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

D. Insulated ducts conveying air above ambient temperature:

1. Provide with or without standard vapor barrier jacket.
2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

E. Do not insulate ductwork exposed in finished spaces.

3.3 SCHEDULES

A. Duct System Insulation:

1. Exhaust air ducts and plenums— Insulate ductwork: Mineral Fiber Blanket Insulation minimum 1-1/2 inches thick.

END OF SECTION

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SECTION 231126 - PETROLEUM GAS PIPING

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. Pipes, tubes, and fittings.
 - 2. Piping specialties.
 - 3. Piping and tubing joining materials.
 - 4. Valves.
 - 5. Pressure regulators.
 - 6. Storage containers.
 - 7. Concrete bases.

1.3 DEFINITIONS

- A. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- D. LPG: Liquefied-petroleum gas.

1.4 PERFORMANCE REQUIREMENTS

- A. Minimum Operating-Pressure Ratings:
 - 1. For Piping Containing Only Vapor:
 - a. Piping and Valves: 125 psig unless otherwise indicated.
- B. LPG System Pressure within Buildings: One pressure range. 0.5 psig or less

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of the following:
 - 1. Piping specialties.
 - 2. Corrugated stainless-steel tubing with associated components.
 - 3. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models if applicable.
 - 4. Pressure regulators. Indicate pressure ratings and capacities.
 - 5. Dielectric fittings.
 - 6. Storage containers.
 - 7. Signage.

1.6 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans and details, drawn to scale, on which LPG piping is shown and coordinated with other installations, using input from installers of the items involved.
- B. Site Survey: Plans, drawn to scale, on which LPG piping is shown and coordinated with other services and utilities.
- C. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

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

1.8 QUALITY ASSURANCE

- 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.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. 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.
- B. Store pipes and tubes with protective PE coating to avoid damaging coating and protect from direct sunlight.

1.10 PROJECT CONDITIONS

- A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.

1.11 COORDINATION

- A. Coordinate sizes and locations of concrete bases and protective bollards with actual equipment provided.

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

- A. Steel Pipe: ASTM A53/A53M, black steel, Schedules 40 and 80, 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 welding 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: ASME B16.20, metallic, flat, asbestos free, aluminum o-rings, and spiral-wound metal gaskets.
 - e. Bolts and Nuts: ASME B18.2.1, carbon steel aboveground, and stainless-steel underground.
 - 5. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.
 - a. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.
 - 6. Mechanical Couplings:
 - a. Steel flanges and tube with epoxy finish.
 - b. Buna-nitrile seals.
 - c. Steel bolts, washers, and nuts.
 - d. Coupling shall be capable of joining PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.
 - e. Steel body couplings installed underground on plastic pipe shall be factory equipped with anode.
- B. Corrugated, Stainless-Steel Tubing: Comply with ANSI/IAS LC 1.
 - 1. Tubing: ASTM A240/A240M, corrugated, Series 300 stainless steel.
 - 2. Coating: PE with flame retardant.
 - a. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

- 1) Flame-Spread Index: 25 or less.
- 2) Smoke-Developed Index: 50 or less.
3. Fittings: Copper-alloy mechanical fittings with ends made to fit and listed for use with corrugated stainless-steel tubing and capable of metal-to-metal seal without gaskets. Include brazing socket or threaded ends complying with ASME B1.20.1.
4. Striker Plates: Steel, designed to protect tubing from penetrations.
5. Manifolds: Malleable iron or steel with factory-applied protective coating. Threaded connections shall comply with ASME B1.20.1 for pipe inlet and corrugated tubing outlets.
6. Operating-Pressure Rating: 5 psig.
 - a. Dryseal threads complying with ASME B1.20.3.

2.2 PIPING SPECIALTIES

A. Flexible Piping Joints:

1. Approved for LPG service.
2. Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket.
3. Minimum working pressure of 250 psig and 250 deg F operating temperature.
4. Flanged- or threaded-end connections to match equipment connected and shall be capable of minimum 3/4-inch misalignment.

B. Appliance Flexible Connectors:

1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
2. Corrugated stainless-steel tubing with polymer coating.
3. Operating-Pressure Rating: 0.5 psig.
4. End Fittings: Zinc-coated steel.
5. Threaded Ends: Comply with ASME B1.20.1.
6. Maximum Length: 72 inches.
- 7.

C. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

2.3 JOINING MATERIALS

A. Joint Compound and Tape: Suitable for LPG.

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.

2.4 MANUAL GAS SHUTOFF VALVES

A. General Requirements for Metallic Valves, NPS 2 and Smaller for Vapor Service: Comply with ASME B16.33.

1. CWP Rating: 125 psig.
 2. Threaded Ends: Comply with ASME B1.20.1.
 3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
 4. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
 5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch and smaller.
 6. Service Mark: Valves 1-1/4 inch to NPS 2 shall have initials "WOG" permanently marked on valve body.
- B. One-Piece, Bronze Ball Valve with Bronze Trim: MSS SP-110.
1. Body: Bronze, complying with ASTM B584.
 2. Ball: Chrome-plated brass.
 3. Stem: Bronze; blowout proof.
 4. Seats: Reinforced TFE; blowout proof.
 5. Packing: Separate packnut with adjustable-stem packing threaded ends.
 6. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
 7. CWP Rating: 600 psig.
 8. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
 9. Service: Suitable for LPG service with "WOG" indicated on valve body.
- C. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.
1. Body: Bronze, complying with ASTM B584.
 2. Ball: Chrome-plated bronze.
 3. Stem: Bronze; blowout proof.
 4. Seats: Reinforced TFE; blowout proof.
 5. Packing: Threaded-body packnut design with adjustable-stem packing.
 6. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
 7. CWP Rating: 600 psig.
 8. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
 9. Service: Suitable for LPG service with "WOG" indicated on valve body.
- D. Two-Piece, Regular-Port Bronze Ball Valves with Bronze Trim: MSS SP-110.
1. Body: Bronze, complying with ASTM B584.
 2. Ball: Chrome-plated bronze
 3. Stem: Bronze; blowout proof.
 4. Seats: Reinforced TFE.
 5. Packing: Threaded-body packnut design with adjustable-stem packing.
 6. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
 7. CWP Rating: 600 psig.
 8. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
 9. Service: Suitable for LPG service with "WOG" indicated on valve body.
- E. Bronze Plug Valves: MSS SP-78.

1. Body: Bronze, complying with ASTM B584.
2. Plug: Bronze.
3. Ends: Threaded, socket, or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
4. Operator: Square head or lug type with tamperproof feature where indicated.
5. Pressure Class: 125 psig.
6. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
7. Service: Suitable for LPG service with "WOG" indicated on valve body.

2.5 PRESSURE REGULATORS

A. General Requirements:

1. Single stage or twin stage and suitable for LPG.
2. Steel or cast aluminum housing and corrosion-resistant components.
3. End Connections: Threaded for regulators NPS 2 and smaller; flanged for regulators NPS 2-1/2 and larger.

B. Service Pressure Regulators: U.L. 144 Listed.

1. Body and Diaphragm Case: Cast iron or die-cast aluminum.
2. Exterior Finish: Red powder coat.
3. Interior Finish: Red powder coat.
4. Springs: Stainless-steel or zinc-plated steel.
5. Diaphragm Plate: Fabric Reinforced NBR with molded lip O-ring bonnet/body seal.
6. Seat Disc: Fluorocarbon (FKM) or Nitrile.
7. Orifice size: 0.15".
8. Relief Type: Internal relief – spring loaded.
9. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet and no pressure sensing piping external to the regulator.
10. Pressure regulator shall maintain discharge pressure setting downstream and not exceed 150 percent of design discharge pressure at shutoff.
11. Overpressure Protection Device: Factory mounted on pressure regulator.
12. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
13. Maximum Inlet Pressure: 250 psig.
14. Basis of Design: Marshall Excelsior Excelsa-Flo model #MEGR-1222-BGJ.

C. Line Pressure Regulators: U.L. 144 Listed.

1. Body and Diaphragm Case: Cast iron or die-cast aluminum.
2. Exterior Finish: Green powder coat.
3. Springs: Stainless-steel or zinc-plated steel.
4. Diaphragm Plate: Fabric reinforced (NBR) with molded lip O-ring body seal.
5. Seat Disc: Fluorocarbon (FKM) or Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
6. Orifice size: 0.14": Aluminum; interchangeable.
7. Relief Type: Internal relief – spring loaded.
8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet and no pressure sensing piping external to the regulator.

9. Pressure regulator shall maintain discharge pressure setting downstream and not exceed 150 percent of design discharge pressure at shutoff.
10. Overpressure Protection Device: Factory mounted on pressure regulator.
11. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
12. Maximum Inlet Pressure: 10 psig.
13. Outlet pressure: 9" W.C. – 13" W.C. adjustable, factory set to 11" W.C.
14. Basis of Design: Marshall Excelsior Excelsa-Flo model #MEGR-1622-BCF.

2.6 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Unions:
 1. Description:
 - a. Standard: ASSE 1079.
 - b. Pressure Rating: 125 psig minimum at 180 deg F.
 - c. End Connections: Solder-joint copper alloy and threaded ferrous.
- C. Dielectric Flanges:
 1. Description:
 - a. Standard: ASSE 1079.
 - b. Factory-fabricated, bolted, companion-flange assembly.
 - c. Pressure Rating: 125 psig minimum at 180 deg F.
 - d. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.
- D. Dielectric-Flange Insulating Kits:
 1. Description:
 - a. Nonconducting materials for field assembly of companion flanges.
 - b. Pressure Rating: 150 psig.
 - c. Gasket: Neoprene or phenolic.
 - d. Bolt Sleeves: Phenolic or polyethylene.
 - e. Washers: Phenolic with steel backing washers.

2.7 STORAGE CONTAINERS

- A. Description: Factory fabricated, complying with requirements in NFPA 58 and ASME Boiler and Pressure Vessel Code and bearing the ASME label. Tanks shall be rated for 250-psig minimum working pressure.
 1. Liquid outlet and vapor inlet and outlet connections shall have shutoff valves with excess-flow safety shutoff valves and bypass and back-pressure check valves with smaller than 0.039-inch drill-size hole to equalize pressure. Liquid-fill connection shall have backflow check valve.

- a. Connections: Color-code and tag valves to indicate type.
 - 1) Liquid fill and outlet, red.
 - 2) Vapor inlet and outlet, yellow.
2. Level gage shall indicate current level of liquid in the container. Gages shall also indicate storage container contents; e.g., "Butane," "50-50 LPG Mix," or "Propane."
3. Pressure relief valves, type and number as required by NFPA 58, connected to vapor space and having discharge piping same size as relief-valve outlet and long enough to extend at least 84 inches directly overhead. Identify relief valves as follows:
 - a. Discharge pressure in psig.
 - b. Rate of discharge for standard air in cfm.
 - c. Manufacturer's name.
 - d. Catalog or model number.
4. Container pressure gage.
5. For outdoor installation, exposed metal surfaces mechanically cleaned, primed, and painted for resistance to corrosion.
6. Ladders for access to valves more than 72 inches aboveground.
7. Stainless-Steel Nameplate: Attach to aboveground storage container or to adjacent structure for underground storage container.
 - a. Name and address of supplier or trade name of container.
 - b. Water capacity in gallons and liters.
 - c. Design pressure in psig (kPa).
 - d. Statement, "This container shall not contain a product having a vapor pressure in excess of **125 psig at 100 deg F.**"
 - e. Outside surface area in sq. ft. (sq. m).
 - f. Year of manufacture.
 - g. Shell thickness in inches (mm).
 - h. Overall length in feet (m).
 - i. OD in feet (m).
 - j. Manufacturer's serial number.
 - k. ASME Code label.
8. Felt support pads and two concrete or painted-steel saddles per storage container. Corrosion protection required at container-to-felt contact.
9. Tie straps for each saddle.
10. Straps and anchors for tie-down slab.
11. Asphalt-based coating for corrosion protection.
12. Container connections and valves protected in manway at top of storage container.
13. Manway equipped with ventilation louvers.
14. Signage of NO SMOKING meeting the requirements of NFPA 58.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for LPG piping system to verify actual locations of piping connections before equipment installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EARTHWORK

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

3.3 PREPARATION

- A. Close equipment shutoff valves before turning off LPG to premises or piping section.
- B. Inspect LPG piping according to NFPA 58 and the International Fuel Gas Code to determine that LPG utilization devices are turned off in piping section affected.
- C. Comply with NFPA 58 and the International Fuel Gas Code requirements for prevention of accidental ignition.

3.4 OUTDOOR PIPING INSTALLATION

- A. Comply with NFPA 58 and the International Fuel Gas Code requirements for installation and purging of LPG piping.
- B. Steel Piping with Protective Coating:
 - 1. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.
 - 2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.
 - 3. Replace pipe having damaged PE coating with new pipe.
- C. Install fittings for changes in direction and branch connections.
- D. Joints for connection to inlets and outlets on regulators, and valves may be flanged or threaded to match the equipment.
- E. Install pressure gage upstream and downstream from each service regulator.

3.5 INDOOR PIPING INSTALLATION

- A. Comply with the International Fuel Gas Code for installation and purging of LPG piping.

- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.
- D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- E. 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.
- F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- G. Locate valves for easy access.
- H. Install LPG piping at uniform grade of 2 percent down toward drip and sediment traps.
- I. Install piping free of sags and bends.
- J. Install fittings for changes in direction and branch connections.
- K. Verify final equipment locations for roughing-in.
- L. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.
- M. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where readily accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.
 - 1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.
- N. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.
- O. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.
- P. Concealed Location Installations: Except as specified below, install concealed LPG piping and piping installed under the building in containment conduit constructed of steel pipe with welded joints as described in Part 2. Install a vent pipe from containment conduit to outdoors and terminate with weatherproof vent cap.
 - 1. Above Accessible Ceilings: LPG piping, fittings, valves, and regulators may be installed in accessible spaces without containment conduit.

2. In Floors: Install LPG piping with welded or brazed joints and protective coating in cast-in-place concrete floors. Cover piping to be cast in concrete slabs with minimum of 1-1/2 inches of concrete. Piping may not be in physical contact with other metallic structures such as reinforcing rods or electrically neutral conductors. Do not embed piping in concrete slabs containing quick-set additives or cinder aggregate.
 3. In Floor Channels: Install LPG piping in floor channels. Channels must have cover and be open to space above cover for ventilation.
 4. In Walls or Partitions: Protect tubing installed inside partitions or hollow walls from physical damage using steel striker barriers at rigid supports.
 - a. Exception: Tubing passing through partitions or walls does not require striker barriers.
 5. Prohibited Locations:
 - a. Do not install LPG piping in or through air ducts, or gas vents (flues), ventilating ducts.
 - b. Do not install LPG piping in solid walls or partitions.
- Q. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.
- R. Connect branch piping from top or side of horizontal piping.
- S. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.
- T. Do not use LPG piping as grounding electrode.
- U. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.
- V. Install pressure gage upstream and downstream from each line regulator.
- W. Install sleeves for piping penetrations of walls, ceilings, and floors.
- X. Install sleeve seals for piping penetrations of concrete walls and slabs.
- Y. Install escutcheons for piping penetrations of walls, ceilings, and floors.
- 3.6 VALVE INSTALLATION
- A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.
 - B. Install underground valves with valve boxes.
 - C. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.
 - D. Install earthquake valves aboveground outside buildings according to listing.

- E. Install anode for metallic valves in underground PE piping.

3.7 PIPING JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Threaded Joints:
 - 1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
 - 2. Cut threads full and clean using sharp dies.
 - 3. Ream threaded pipe ends to remove burrs and restore full ID of pipe.
 - 4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
 - 5. 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. Flanged Joints: Install gasket material, size, type, and thickness appropriate for LPG service. Install gasket concentrically positioned.

3.8 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for pipe hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
- B. Install hangers for steel piping and, with maximum spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- C. Install hangers for corrugated stainless-steel tubing, 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 within 12 inches of each fitting.
- E. Support vertical runs of steel piping to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- F. Support vertical runs of corrugated stainless-steel tubing to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.9 CONNECTIONS

- A. Install LPG piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.

- B. Install piping adjacent to appliances to allow service and maintenance of appliances.
- C. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliances and equipment. Install union between valve and appliances or equipment.
- D. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.10 STORAGE CONTAINER INSTALLATION

- A. Fill storage container to at least 80 percent capacity with propane.
- B. Install piping connections with swing joints or flexible connectors to allow for storage container settlement and for thermal expansion and contraction.
- C. Ground containers according to NFPA 780.
- D. Set storage containers in felt pads on concrete or steel saddles. Install corrosion protection at container-to-felt contact.
- E. Install tie-downs over storage containers on saddles with proper tension.
- F. Set concrete saddles on dowels set in concrete base. Anchor steel saddles to concrete base.
- G. Set storage container on concrete ballast base large enough to offset buoyancy of empty storage container immersed in water.
- H. Install tie-down straps over container anchored in ballast base and repair damaged coating.

3.11 LABELING AND IDENTIFYING

- A. Follow requirements of NFPA 58 and International Fire Code Section 310.

3.12 PAINTING

- A. Comply with requirements in Section 099000 "Paints and Coatings" for painting interior and exterior LPG piping.
- B. Paint exposed, exterior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components with factory-applied paint or protective coating.
 - 1. Alkyd System: MPI EXT 5.1D.
 - a. Prime Coat: Alkyd anticorrosive metal primer.
 - b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
 - c. Topcoat: Exterior alkyd enamel.
 - d. Color: Gray.

- C. Paint exposed, interior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components with factory-applied paint or protective coating.
 - 1. Latex Over Alkyd Primer System: MPI INT 5.1Q.
 - a. Prime Coat: Alkyd anticorrosive or Quick-drying alkyd metal primer.
 - b. Intermediate Coat: Interior latex matching topcoat.
 - c. Topcoat: Interior latex.
 - d. Color: Gray.
 - 2. Alkyd System: MPI INT 5.1E.
 - a. Prime Coat: Alkyd anticorrosive or Quick-drying alkyd metal primer.
 - b. Intermediate Coat: Interior alkyd matching topcoat.
 - c. Topcoat: Interior alkyd.
 - d. Color: Gray.
- D. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

3.13 CONCRETE BASES

- A. Concrete Bases: Anchor equipment to concrete base according to seismic codes at Project.
 - 1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
 - 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
 - 3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
 - 4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 5. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 6. Use 3000-psig, 28-day, compressive-strength concrete and reinforcement as specified in Section 033000 "Cast-in-Place Concrete."

3.14 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Test, inspect, and purge LPG according to NFPA 58 and the International Fuel Gas Code and requirements of authorities having jurisdiction.
- C. LPG piping will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.15 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain LPG equipment.

3.16 OUTDOOR PIPING SCHEDULE

- A. Aboveground LPG vapor piping shall be one of the following:
 - 1. Schedule 40, steel pipe with malleable-iron fittings and threaded joints.
 - 2. Schedule 40, steel pipe with wrought-steel fittings and welded joints, or mechanical couplings.

3.17 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES LESS THAN 0.5 PSIG

- A. Aboveground, branch piping NPS 1 and smaller shall be one of the following:
 - 1. Corrugated stainless-steel tubing with mechanical fittings having socket or threaded ends to match adjacent piping.
 - 2. Aluminum tube with flared fittings and joints.
 - 3. Schedule 40, steel pipe with malleable-iron fittings and threaded joints.
- B. Aboveground, distribution piping shall be one of the following:
 - 1. Schedule 40, steel pipe with malleable-iron fittings and threaded joints.
 - 2. Schedule 40, steel pipe with wrought-steel fittings and welded joints.

3.18 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

- A. Distribution piping valves for pipe NPS 2 and smaller shall be one of the following:
 - 1. One-piece, bronze ball valve with bronze trim.
 - 2. Two-piece regular-port, bronze ball valves with bronze trim.
 - 3. Bronze plug valve.
- B. Valves in branch piping for single appliance shall be one of the following:
 - 1. One-piece, bronze ball valve with bronze trim.
 - 2. Two-piece, regular-port, bronze ball valves with bronze trim.
 - 3. Bronze plug valve.

END OF SECTION 231126

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Metal ductwork.

1.2 SUBMITTALS

- A. See Division 1 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for duct materials.
- C. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of documented experience.
- C. Sheet metal workers shall have a minimum documented sheet metal fabrication and installation experience in commercial or industrial facilities of three years or be enrolled in an Alaska Department of Labor approved Sheet Metal Apprentice program. The ratio of on-site workers shall not exceed three apprentices or sheet metal workers for every one foreman. A foreman is defined as a sheet metal worker with minimum three years' experience as detailed above or is an approved Journeyman.

1.4 REGULATORY REQUIREMENTS

- A. Construct ductwork to NFPA 90A standards.

1.5 FIELD CONDITIONS

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 - PRODUCTS

2.1 DUCT ASSEMBLIES

- A. Ducts: 2 inch w.g. pressure class, Galvanized steel, unless otherwise indicated.

2.2 MATERIALS

- A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating. Minimum 24 gage material for ductwork. Minimum of 20 gage material for plenums.
- B. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
 - 1. Type: Heavy mastic or liquid used, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
 - 2. Surface Burning Characteristics: Flame spread of zero, smoke developed of zero, when tested in accordance with ASTM E84.
- C. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.3 DUCTWORK FABRICATION

- A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
- B. No variation of duct configuration or size permitted except by written permission. Size round duct installed in place of rectangular ducts in accordance with ASHRAE Handbook - Fundamentals.
- C. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- D. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation.
- E. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.
- F. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- G. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- H. Fittings shall be spot welded two gages heavier than indicated in SMACNA Standard. Prime coat welded joints. Round ductwork shall be spiral type. Utilize manufactured duct fittings for branch take-offs unless indicated otherwise.

- I. Where ducts are connected to exterior wall louvers and duct connection is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.
- J. Provide standard 45-degree lateral wye takeoffs unless otherwise indicated where 90-degree conical tee connections may be used.
- K. Pleated 90 degree round elbows may be used only on duct 8-inch diameter and under. Use segmented 5 piece elbows on 90 degree elbows 10 inches and over. 90 degree adjustable elbows are not acceptable unless approved on a case by case basis by the Engineer.
- L. Flanged closures must be SMACNA "J" rated with minimum 1-3/8 inch flange. Flange shall be gasketed. Corners bolted. Metal cleat for application around perimeter of transverse joint.
- M. Transverse joints: Ductmate proprietary duct connections will be accepted. Ductwork constructed using these systems will refer to manufacturers guidelines for sheet gage, intermediate reinforcement size and spacing, and joint reinforcement. TDF shall be constructed in accordance with SMACNA – HVAC Duct Construction Standards Manuals T-24 flange. Basis for evaluating a substitution shall be Ductmate Joining System, steel construction. Ductmate system shall utilize minimum 20 gage steel companion angles, 12 gage steel corner pieces, and an integral polymer mastic seal. Acceptable joining systems: Ductmate 35, Nexus, Accuduct, or TDF. TDC is not acceptable.
- N. Longitudinal seams and fitting: Pittsburgh lock or snap lock shall be used on longitudinal seams. Use Pittsburgh only on fittings, snap lock is not acceptable.

2.4 DUCTSEALANTS

- A. Sealant: UL listed vinylacrylic or copolymer based duct sealer. Similar to Durodyne DDS-181, Uni-mastic 181.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify sizes of equipment connections before fabricating transitions.
- B. Verify on-site conditions prior to beginning work. Coordinate closely with Plumbing Contractor, Electrical Contractor, and architectural and structural conflicts.

3.2 INSTALLATION

- A. Install, support, and seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- B. Install in accordance with manufacturer's instructions.

- C. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system. Check daily or more frequently that sealing of ducts is intact.
- E. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.
- F. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pitot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.
- G. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- H. Use double nuts and lock washers on threaded rod supports.
- J. At exterior wall louvers, seal duct to louver frame and install blank-out panels.
- K. Duct and Plenum Sealing:
 - 1. Seal longitudinal and latitudinal joints of metal ducts with two coats of sealant. Apply sealant in accordance with manufacturer's recommendations. Apply second coat of sealant after first coat has completely cured. Inspect seams with ductwork pressurized and reapply as required for an airtight application.
 - 2. Exhaust Fan inlet and outlet ducts: Apply two coats of sealant to seams.
- L. Duct traverses at exhaust fan inlets shall be compared to total grille and diffuser airflows for each fan unit to determine the percentage duct leakage. If the duct leakage is determined to be over 10% of the specified volume, the Contractor shall reseal ductwork to the satisfaction of the Engineer.

3.3 INTERFACE WITH OTHER PRODUCTS

- A. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pitot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

3.4 CLEANING

- A. If supply or exhaust air ductwork is found to be dirty during construction due to inadequately capped/sealed ductwork or operating fans without filters, the Contractor shall clean affected duct systems with high power vacuum machines to the satisfaction of the Engineer. Protect equipment that may be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes. Construction debris is to be removed by Contractor prior to cleaning.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Duct access doors.
- B. Manual control dampers.
- C. Ceiling Mounted, Louvered Face Supply Diffusers.
- D. Gravity Ventilator Hoods.
- E. Sleeves
- F. Dryer Exhaust Receptacle

1.2 SUBMITTALS

- A. See Division 1 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide for shop fabricated assemblies including volume dampers.
- C. Project Record Drawings: Record actual locations of access doors and test holes.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect dampers from damage to operating linkages and blades.

PART 2 - PRODUCTS

2.1 DUCT ACCESS DOORS

- A. Manufacturers:
 - 1. Air Balance
 - 2. Durodyne
 - 3. Ventlock
 - 4. Ruskin Company
- B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

- C. Fabrication: Rigid and close fitting of reinforced galvanized steel with closed cell neoprene sponge rubber sealing gaskets and quick fastening locking devices. For insulated ductwork, install minimum 1-inch thick insulation with sheet metal cover.
 - 1. Less Than 12 inches square, secure with sash locks.
 - 2. Up to 18 inches Square: Provide two small hinges or one continuous hinge and one compression latch.
 - 3. Up to 24 x 48 inches: Three large hinges or one continuous hinge and two compression latches with outside and inside handles.
 - 4. Sash Lock: Similar to Ventlock Model 90.
 - 5. Compression Latch: Similar to Ventlock Model 140, 202, or 310.
 - 6. Hinge: Small hinges to be zinc plated steel, minimum 2 x 1-1/2 inches wide or 1-1/2 inch wide piano hinge. Large hinges to be zinc plated steel, minimum 3 x 2 inches wide or 2 inch wide piano hinge. Similar to Ventlock Model 150, 157 or 167, 250.
 - 7. Access panels with sheet metal screw fasteners are not acceptable.

2.2 MANUAL VOLUME DAMPERS

- A. Manufacturers:
 - 1. Ventlock
 - 2. Nailor Industries Inc
 - 3. Ruskin Company
 - 4. Durodyne
 - 5. Rossi
- B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
- C. Single Blade Dampers: Fabricate for duct sizes up to 12-inch maximum dimension.
 - 1. Fabricate for duct sizes up to 12 inch.
 - 2. Blade: 24 gage, minimum.
- D. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
 - 1. Blade: 18 gage, minimum.
- E. End Bearings: Except in round ductwork 8 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings. Provide closed end bearings on all ducts having a pressure classification over 2 inches wg; Ventlock Model 607 or 609. Similar Durodyne or Young.
- F. Regulators:
 - 1. Provide self-locking, indicating regulators with heavy steel stamped handle on single and multi-blade dampers.
 - 2. On insulated ducts mount regulators on standoff mounting brackets, bases, or adapters.
 - 3. Where rod lengths exceed 30 inches provide regulator at both ends.

4. Ventlock Model 641. Similar Durodyne or Young.
5. For concealed damper locations use concealed damper regulator type for installation in ceilings. Ventlock Model 666. Similar Durodyne or Young.
6. Regulators with wing nuts are not acceptable.

2.3 LOUVER FACE DIFFUSERS, SD

- A. Manufacturers:
 1. Titus TDCA
 2. Krueger
 3. Price
- B. Type: Surface mount type for hard ceilings. Removable Core.
- C. Diffusers: Fixed vanes. Core for discharge pattern of two-way corner blow.
- D. Frame: Surface type border for hard ceilings.
- E. Fabrication: Aluminum with white baked enamel finish.
- F. Supply Diffusers Sizes, Volumes, Blow
 1. SD-1: 12x12 inch square, 195 cfm, Corner directional vanes – two way blow
 2. SD-2: 9x9 inch square, 55 cfm/160 cfm, 4-way blow.
- G. Trim: Provide square to round adapter as required. Round adapter same size as duct size.

2.4 GRAVITY VENTILATOR HOODS, H-1 AND H-2

- A. Manufacturers:
 1. ACME
 2. Cook
 3. Metalform
 4. Greenheck
- B. Fabricate intake/exhaust hoods in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible. Third party certified for high wind.
- C. Low contour, rectangular type. Fabricate of reinforced aluminum, minimum 16 gage base and 18 gage hood. Provide hinged removable hood; bird screen with 1/2 inch square mesh for exhaust, and factory finish with a thermosetting polyester urethane. Prepare steel with a phosphatized treatment. Coating suitable for salt spray marine type applications. Coordinate color with Architect.
- D. Mount unit on minimum 18 inch high curb base on upper side of curb (short side) with insulation between duct and curb.
- E. Make hood inlet or outlet free area minimum of twice throat area.

- F. Throat and top insulated on inside to preclude condensation. Seal edges of insulation.
- G. Caps: Install on pre-insulated curb pitched to specific roof and provided hereunder.

2.5 SLEEVES

- A. Sleeves for Ductwork: Galvanized steel.

2.6 DRYER EXHAUST RECEPTACLE

- A. Material: 22 gauge aluminized steel.
- B. Mounting: Recessed, for use with 2 by 6 wall framing.
- C. Performance:
 - 1. Dryer vent hose receptacle for upward venting.
 - 2. Compatible with pedestal and stand-alone dryers.
- D. Basis of Design: The Dryerbox DB-480 .

2.7 FLEXIBLE DUCT CONNECTIONS

- A. Manufacturers:
 - 1. Carlisle HVAC
 - 2. Elgen Manufacturing
 - 3. DuroDyne.
- B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
- C. Flexible Duct Connections: Fabric crimped into metal edging strip.
 - 1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd. Net Fabric Width: Approximately 2 inches wide.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Verify that electric power is available and of the correct characteristics.
- B. Verify ducts and equipment installations are ready for accessories.

3.2 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Refer to Section 233100 for duct construction and pressure class.

- B. Set sleeves in position in forms. Provide reinforcing around sleeves. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- C. Where ductwork penetrates floor, ceiling, or wall, close off space between duct and adjacent WORK with stuffing or fire stopping insulation and caulk airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- D. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.
- E. Provide balancing dampers at points on exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.
- F. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

3.3 INSTALLATION

- A. Install diffusers level and plumb.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
- D. Match damper material to duct material.
- E. Install diffusers with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.
- F. Install gravity ventilator hoods level, plumb, and at indicated alignment with adjacent work.
- G. Secure gravity ventilator hoods to roof curbs with zinc-plated hardware [that comply with the wind and seismic fastening requirements]. Use concealed anchorages where possible.
- H. Install gravity ventilator hoods with clearances for service and maintenance.
- I. Install perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

- J. Install concealed gaskets, flashings, joint fillers, and insulation as installation progresses. Comply with Section 079200 "Joint Sealants" for sealants applied during installation.
- K. Label gravity ventilator hoods according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."
- L. Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.
- M. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes, so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

3.4 DUCT CONNECTIONS

- A. Coordinate duct installation and specialty arrangements with schematics on Drawings and with requirements specified in duct systems. If Drawings are explicit enough, these requirements may be reduced or omitted.
- B. Duct installation and connection requirements are specified in Section 233113 "Metal Ducts." Drawings indicate general arrangement of ducts and duct accessories.

3.5 ADJUSTING

- A. After installation, adjust diffusers to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Ceiling Mounted Fans.
- B. Motors.

1.2 SUBMITTALS

- A. See Division 1 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels at rated capacity, and electrical characteristics and connection requirements.
- C. Manufacturer's Instructions: Indicate installation instructions.
- D. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.4 FIELD CONDITIONS

- A. Permanent ventilators may not be used for ventilation during construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Greenheck
- B. Loren Cook Company
- C. Twin City Fan

2.2 POWER VENTILATORS - GENERAL

- A. Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA

Certified Rating Seal.

- B. Sound Ratings: AMCA 301, tested to AMCA 300, and bearing AMCA Certified Sound Rating Seal.
- C. Fabrication: Conform to AMCA 99.
- D. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.
- E. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

2.3 EXHAUST FANS (EF-1 THROUGH EF-6)

- A. Performance Ratings:
 - 1. See schedule on M-002
- B. Centrifugal Fan Unit: Direct driven with galvanized steel housing and scroll, resilient mounted motor, round outlet duct with gravity backdraft damper in discharge.
- C. Disconnect Switch: Cord and plug in housing for thermal overload protected motor and wall mounted switch.
- D. Grille: Molded white plastic.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Secure ceiling mounted exhaust fans to ceiling as required by manufacturer.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Electric Baseboard.
 - 2. Recessed Electric Cabinet Unit Heater.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated capacities, operating characteristics, furnished specialties, and accessories.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, and details.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include details and dimensions of custom-fabricated enclosures.
 - 4. Indicate location and size of each field connection.
 - 5. Indicate location and arrangement of integral controls.
 - 6. Include enclosure joints, corner pieces, access doors, and other accessories.
 - 7. Include diagrams for power, signal, and control wiring.
- C. Samples: For each exposed product and for each color and texture specified.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 ELECTRIC BASEBOARD

- A. Description: Factory-packaged units constructed according to UL 499, UL 1030, and UL 2021.
 - 1. 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. Heating Elements: Nickel-chromium-wire heating element enclosed in metallic sheath mechanically bonded to fins, with high-temperature cutout and sensor running the full length of the element. Element supports shall eliminate thermal expansion noise. See Schedules for Power Information.

- C. Enclosures: Minimum 22 gage thick steel, removable front cover.
 - 1. Full-height back.
 - 2. Full-length damper.
 - 3. End panel.
 - 4. End caps.
 - 5. Inside and outside corners.
 - 6. Joiner pieces to snap together.
 - 7. Enclosure Height: 5-1/2 inches.
 - 8. Enclosure Depth: 2-1/2 inches.
 - 9. Finish: Baked-enamel finish in manufacturer's standard color as selected by Architect.
 - 10. Element Brackets: Primed and painted steel to support front panel and element.
- D. Unit Controls: Integral line-voltage thermostat, tamper proof.
- E. Accessories:
 - 1. Filler sections without a heating element matching the adjacent enclosure.
 - 2. Straight-blade-type receptacles complying with DSCC W-C-596G/GEN, NEMA WD 1, NEMA WD 6, and UL 498; in color selected by Architect.

2.2 RECESSED ELECTRIC CABINET UNIT HEATER

- A. Manufacturers:
- B. Description:
 - 1. Assembly including chassis, electric heating coil, fan, motor, and controls. Comply with UL 2021.
 - 2. 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. Cabinet:
 - 1. Front Panel: Stamped-steel louver, with removable panels fastened with tamperproof fasteners. 18 gage construction.
 - 2. Finish: Baked enamel over baked-on primer with manufacturer's standard color selected by Architect, applied to factory-assembled and -tested wall and ceiling heaters before shipping.
 - 3. Surface-Mounted Cabinet Enclosure: Steel with finish to match cabinet.
- D. Coil: Electric-Resistance Heating Coil: High mass ceramic element with 7/8-inch diameter aluminum tube filled with high density ceramic. Nickel-chromium heating coil, free from expansion noise and 60 hertz frequency noise, embedded in magnesium oxide refractory and sealed in corrosion-resistant metallic sheath. Terminate elements in stainless-steel, machine-staked terminals secured with stainless-steel hardware, and limit controls for high-temperature protection. Provide integral circuit breaker for overcurrent protection.
- E. Fan and Motor:

1. Fan: Multiple blowers. Aluminum propeller directly connected to motor.
 2. Motor: Permanently lubricated.
- F. Controls:
1. Controls: Unit-mounted thermostat.
 2. Electrical Connection: Factory wire motors and controls for a single field connection.
- G. Capacities and Characteristics: See Schedule on drawings.

PART 3 - EXECUTION

3.1 ELECTRIC BASEBOARD INSTALLATION

- A. Install units level and plumb.
- B. Install enclosure continuously around corners, using outside and inside corner fittings.
- C. Install air-seal gasket between wall and recessed flanges or front cover of fully recessed unit.

3.2 RECESSED ELECTRIC CABINET UNIT HEATER INSTALLATION

- A. Coordinate location and framing requirements with General Contractor.
- B. Install wall unit heaters to comply with NFPA 90A.
- C. Install wall unit heaters level and plumb.

3.3 CONNECTIONS

- A. Ground electric finned-tube radiation heaters according to Division 26 Electrical.
- B. Connect wiring according to Division 26 Electrical.

3.4 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections:
 1. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Units will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper building wire.
2. Metal-clad cable, Type MC.
3. Conductors and cables for automatic faucet and flush devices.
4. Connectors and splices.

1.2 ACTION SUBMITTALS

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

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 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. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.
- D. Ground Conductor: Insulated.
- E. Conductor Insulation:
 - 1. Type TFN/THHN/THWN-2. Comply with UL 83.
 - 2. Type XHHW-2. Comply with UL 44.
- F. Armor: Steel, interlocked.
- G. Jacket: PVC applied over armor.

2.3 CONDUCTORS AND CABLES FOR AUTOMATIC FAUCET AND FLUSH DEVICES

- A. Description: Conductors and cables for power and/or controls below line voltage, for automatic faucet and flush devices.
 - 1. Coordinate with Mechanical for exact equipment.
 - 2. Follow manufacturer instructions and recommendations.
 - 3. Minimum requirements: Stranded copper, Type THHN/THWN-2, complying with UL 83, in raceway, No. 18 AWG minimum.

2.4 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 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.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders:
 - 1. Copper; stranded.
- B. Branch Circuits:
 - 1. Copper; stranded.
- C. Control: Copper; Stranded.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type XHHW-2, single conductors in raceway.
- B. Feeders: Type XHHW-2, single conductors in raceway.
- C. Indoor with ambient temperature 32 deg F minimum:
 - 1. Branch Circuits: Type THHN/THWN-2 or XHHW, single conductors in raceway.
- D. Outdoor, wet locations or indoor with ambient temperature below 32 deg F:
 - 1. Branch Circuits: Type XHHW, single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors in public rooms unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points according to Section 260533.13 "Conduits for Electrical Systems" prior to pulling conductors and cables.
- C. Use Type MC cable only where concealed, or in lieu of flexible metallic conduit.
- D. Minimum conductor size for branch circuits: No. 12 AWG.
 - 1. Use No. 10 AWG minimum for 15 or 20 ampere, 120 volt branch circuits longer than 65 feet but not greater than 100 feet.
 - 2. Use No. 8 AWG minimum for 15 or 20 ampere, 120 volt branch circuits longer than 100 feet unless otherwise indicated.
 - 3. Use No. 10 AWG minimum for 15 or 20 ampere, 277 volt branch circuits longer than 150 feet unless otherwise indicated.

- E. The size of conductors, including equipment grounding conductor, shall remain unchanged for the entire length of the circuit.
 - 1. If conductors are oversized for derating or voltage drop purposes and are too large to land properly on intended devices, downsizing the conductors in the immediate vicinity of the served equipment to suit overcurrent protection is acceptable.
- F. 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.
- G. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- H. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- I. 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 inch (150 mm) 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 FIELD QUALITY CONTROL

- A. Administrant for Tests and Inspections:
 - 1. Administer and perform tests and inspections.

B. 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.
 - 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.

C. Cables will be considered defective if they do not pass tests and inspections.

D. 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 260519

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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 heat tracing for snow and ice melting in gutters and downspouts, including drainpipe to drywell, with the following electric heating cables:
 - 1. Self-regulating, parallel resistance.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated capacities, operating characteristics, and furnished specialties and accessories. Include securing accessories such as downspout hangers, and securing clips if used.
 - 2. Schedule heating capacity, length of cable, spacing, and electrical power requirement for each electric heating cable required.
- B. Shop Drawings: For electric heating cable.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.
- B. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For electric heating cables to include in operation and maintenance manuals.

1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace electric heating cable that fails in materials or workmanship within specified warranty period.

1. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SELF-REGULATING, PARALLEL-RESISTANCE HEATING CABLES

- A. Comply with IEEE 515.1.
- B. Heating Element: Pair of parallel No. 16 AWG, nickel-coated, stranded copper bus wires embedded in crosslinked conductive polymer core, which varies heat output in response to temperature along its length. Terminate with waterproof, factory-assembled, nonheating leads with connectors at one end, and seal the opposite end watertight. Cable shall be capable of crossing over itself once without overheating.
- C. Electrical Insulating Jacket: Flame-retardant polyolefin.
- D. Cable Cover: Tinned-copper braid and polyolefin outer jacket with ultraviolet inhibitor.
- E. Maximum Operating Temperature (Power On): 150 deg F.
- F. Maximum Exposure Temperature (Power Off): 185 deg F.
- G. 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.
- H. Capacities and Characteristics:
 1. Maximum Heat Output: 5 W/ft..
 2. Electrical Characteristics for Single-Circuit Connection:
 - a. Volts: 120.
 - b. Phase: Single-phase.
 - c. Hertz: 60.

2.2 ACCESSORIES

- A. Cable Installation Accessories: Power connection, end seal and splice kits, and installation clips all furnished by manufacturer, or as recommended in writing by manufacturer.
- B. Warning Labels: Refer to Section 260553 "Identification for Electrical Systems."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces and substrates to receive electric heating cables for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Ensure surfaces and pipes in contact with electric heating cables are free of burrs and sharp protrusions.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

- A. Install the following types of electric heating cable for the applications described:
 1. Snow and Ice Melting in Gutters and Downspouts: Self-regulating, parallel-resistance heating cable.

3.3 INSTALLATION

- A. Install electric heating cable according to manufacturer's written instructions; use cable-protection conduit and slack cable to allow movement without damage to cable.
- B. Install electric heating cable as indicated on Drawings.
- C. Electric Heating-Cable Installation for Snow and Ice Melting in Gutters and Downspouts: Install in gutters and downspouts with clips furnished by manufacturer that are compatible with gutters and downspouts.

3.4 CONNECTIONS

- A. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.5 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 1. Perform tests after cable installation but before application of coverings such as insulation, wall or ceiling construction, or concrete.
 2. Test cables for electrical continuity and insulation integrity before energizing.
 3. Test cables to verify rating and power input. Energize and measure voltage and current simultaneously.
- B. Repeat tests for continuity, insulation resistance, and input power after applying thermal insulation on pipe-mounted cables.
- C. Cables will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

3.6 PROTECTION

- A. Protect installed heating cables, including non-heating leads, from damage during construction.
- B. Remove and replace damaged heat-tracing cables.

END OF SECTION 260522

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. Grounding (earthing) electrodes.

1.2 ACTION SUBMITTALS

A. Product Data:

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. Grounding (earthing) electrodes.

B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 GROUNDING AND BONDING CONDUCTORS

A. Equipment Grounding Conductor:

1. General Characteristics: 600 V, XHHW/XHHW-2 or THHN/THWN-2, copper or tinned-copper wire or cable, green color, in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. 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.
 - c. Tin-Coated Soft or Annealed Copper Wire: ASTM B33.

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. 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 and KDSH - Hex-Fitting-Type Pipe and Rod Grounding and Bonding Clamp:
 - 1. General Characteristics:
 - a. Two pieces with stainless steel bolts.
 - b. Clamp Material: Brass.
 - c. Listed for outdoor use.
- D. UL KDER and KDSH - U-Bolt-Type Pipe and Rod Grounding and Bonding Clamp:
 - 1. General Characteristics:
 - a. Clamp Material: Brass.
 - b. Listed for outdoor use.
- E. UL KDER and KDSH - Strap-Type Pipe and Rod Grounding and Bonding Clamp:
 - 1. General Characteristics:
 - a. Clamp Material: Copper.
 - b. Listed for outdoor use.
- F. UL KDER - Beam Grounding and Bonding Clamp:
 - 1. General Characteristics: Mechanical-type, terminal, ground wire access from four directions; with dual, tin-plated or silicon bronze bolts.
- G. UL KDER - Exothermically Welded Connection:
 - 1. General Characteristics: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

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. 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 - Bonding Bushing:
 - 1. General Characteristics: Threaded bushing with insulated throat.
- D. 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. 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 - Grounding and Bonding Hub:
 - 1. General Characteristics: Insulated, gasketed, watertight hub with mechanical-type wire terminal.

2.5 GROUNDING AND BONDING CONNECTORS

- A. 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. 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.
- C. 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.

2.6 GROUNDING (EARTHING) ELECTRODES

- A. Description: Grounding electrodes include rod electrodes, ring electrodes, metal underground water pipes, metal building frames, concrete-encased electrodes, and pipe and plate electrodes.
- 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 (19 mm by 3 m).

PART 3 - EXECUTION

3.1 SELECTION OF GROUNDING AND BONDING PRODUCTS FOR ELECTRICAL POWER

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 Jumper: Copper tape, braided conductors terminated with copper ferrules; **1-5/8 inch (41 mm)** wide and **1/16 inch (1.6 mm)** thick.
3. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; **1-5/8 inch (41 mm)** wide and **1/16 inch (1.6 mm)** thick.
4. Underground Grounding Conductors: Install bare copper conductor, size as indicated on drawings.

B. Grounding and Bonding Connectors:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except as otherwise indicated.
3. Connections to Structural Steel: Welded connectors.

3.2 INSTALLATION OF GROUNDING AND BONDING FOR ELECTRICAL POWER

A. Comply with manufacturer's published instructions.

B. 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 **24 inch (750 mm)** below grade.

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) Use exothermic-welded or high compression 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. Electrodes:
 - a. Ground Rods: Drive rods until tops are **2 inch (50 mm)** 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 or high compression fittings for below-grade connections.
 - b. For grounding electrode system, install at least three 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.
4. 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.
5. Grounding Underground Distribution System Components:
 - a. Comply with IEEE C2 grounding requirements.
 - b. Grounding Manholes, Vaults, and Handholes: Install driven ground rod through manhole, vault, or handhole floor, close to wall, and set rod depth so **4 inch (100 mm)** will extend above finished floor.
 - c. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole, vault, or handhole, to ground rod or grounding conductor. Make connections with 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole

walls. Connect to cable armor and cable shields in accordance with manufacturer's published instructions with splicing and termination kits.

6. Equipment Grounding:

- a. Install insulated equipment grounding conductors with feeders and branch circuits.
- b. 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.

3.3 FIELD QUALITY CONTROL FOR GROUNDING AND BONDING OF ELECTRICAL POWER

A. Tests and Inspections:

1. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with calibrated torque wrench in accordance with manufacturer's published instructions.

3.4 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 260526

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PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Support, anchorage, and attachment components.
 2. Fabricated metal equipment support assemblies.

1.2 ACTION SUBMITTALS

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

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum **13/32 inch (10 mm)** diameter holes at a maximum of **8 inch (200 mm)** on center in at least one surface.
1. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
 2. Material for Channel, Fittings, and Accessories: Galvanized steel.
 3. Channel Width: Selected for applicable load criteria.
 4. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
- B. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- C. Structural Steel for Fabricated Supports and Restraints: ASTM A36/A36M steel plates, shapes, and bars; black and galvanized.
- D. 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.
 2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated or stainless steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 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** (**Grade A325M**).
6. Toggle Bolts: Stainless steel springhead type.
7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

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
- B. Comply with requirements for raceways specified in Section 260533.13 "Conduits for Electrical Systems."
- C. Comply with requirements for boxes specified in Section 260533.16 "Boxes and Covers for Electrical Systems."
- D. 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** (**6 mm**) in diameter.

3.2 INSTALLATION OF SUPPORTS

- A. Comply with NECA NEIS 101 for installation requirements except as specified in this article.
- B. 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** (**90 kg**).
- C. 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. 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 (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inch (100 mm) thick.
 5. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts or beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69.
 6. To Light Steel: Sheet metal screws.
 7. 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.
- D. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- B. Field Welding: Comply with AWS D1.1/D1.1M.

END OF SECTION 260529

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PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Type EMT-S duct raceways and elbows.
2. Type HDPE duct raceways and fittings.
3. Type ERMC-S duct raceways, elbows, couplings, and nipples.
4. Type FMC-S duct raceways.
5. Type IMC duct raceways.
6. Type LFMC duct raceways.
7. Type PVC duct raceways and fittings.
8. Fittings for conduit, tubing, and cable.
9. Electrically conductive corrosion-resistant compounds for threaded conduit.
10. Solvent cements.

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 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:

1. Type EMT-S duct raceways and elbows.
2. Type HDPE duct raceways and fittings.
3. Type ERMC-S duct raceways, elbows, couplings, and nipples.
4. Type FMC-S duct raceways.
5. Type IMC duct raceways.
6. Type LFMC duct raceways.
7. Type PVC duct raceways and fittings.
8. Fittings for conduit, tubing, and cable.
9. Electrically conductive corrosion-resistant compounds for threaded conduit.
10. Solvent cements.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturers' Published Instructions:

1. Type EMT-S duct raceways and elbows.
2. Type HDPE duct raceways and fittings.
3. Type ERMC-S duct raceways, elbows, couplings, and nipples.
4. Type FMC-S duct raceways.
5. Type IMC duct raceways.
6. Type LFMC duct raceways.
7. Type PVC duct raceways and fittings.
8. Fittings for conduit, tubing, and cable.
9. Electrically conductive corrosion-resistant compounds for threaded conduit.
10. Solvent cements.

PART 2 - PRODUCTS

2.1 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.

C. UL FJMX - Steel Electrical Metal Tubing (EMT-S) and Elbows:

1. Material: Steel.
2. Required Options:
 - a. Exterior Coating: Zinc.
 - b. Interior Coating: Zinc with organic top coating.
 - c. Minimum Trade Size: Metric designator 16 (trade size 1/2).

2.2 TYPE HDPE 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.
- C. UL EAZX - Schedule 40 Electrical HDPE Underground Conduit (HDPE-40):
 - 1. Dimensional Specifications: Schedule 40.
 - 2. Options:
 - a. Minimum Trade Size: Metric designator 21 (trade size 3/4).

2.3 TYPE ERMCS 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.
- C. UL DYIX - Galvanized-Steel Electrical Rigid Metal Conduit (ERMC-S-G), Elbows, Couplings, and Nipples:
 - 1. Exterior Coating: Zinc.
 - 2. Required Options:
 - a. Interior Coating: Zinc with organic top coating.
 - b. Minimum Trade Size: Metric designator 21 (trade size 3/4).

2.4 TYPE FMC-S 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.
- C. UL DXUZ - Steel Flexible Metal Conduit (FMC-S):

1. Material: Steel.
2. Required Options:
 - a. Minimum Trade Size: Metric designator 16 (trade size 1/2).

2.5 TYPE IMC 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 DYBY; including UL 1242.

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.

C. UL DYBY - Steel Intermediate Metal Conduit (IMC):

1. Required Options:
 - a. Exterior Coating: Zinc.
 - b. Interior Coating: Zinc with organic top coating.
 - c. Minimum Trade Size: Metric designator 21 (trade size 3/4).

2.6 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.

C. UL DXHR - Steel Liquidtight Flexible Metal Conduit (LFMC-S):

1. Material: Steel.
2. Required Options:
 - a. Minimum Trade Size: Metric designator 21 (trade size 3/4).

2.7 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 DZXR; 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.

C. UL DZXR - Schedule 40 Rigid PVC Conduit (PVC-40) and Fittings:

1. Dimensional Specifications: Schedule 40.
2. Required Options:
 - a. Minimum Trade Size: Metric designator 21 (trade size 3/4).

D. UL DZXR - Schedule 80 Rigid PVC Conduit (PVC-80) and Fittings:

1. Dimensional Specifications: Schedule 80.
2. Required Options:
 - a. Minimum Trade Size: Metric designator 21 (trade size 3/4).

2.8 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.

C. UL DWTT - Fittings for Type ERMC, Type IMC, Type PVC, and Type HDPE Duct Raceways:

1. Listing Criteria: UL CCN DWTT; including UL 514B.
2. Required Options:
 - a. Material: Steel.
 - b. Expansion and Deflection Fittings: UL 651 with flexible bonding jumper.

D. UL FKAV - Fittings for Type EMT Duct Raceways:

1. Listing Criteria: UL CCN FKAV; including UL 514B.
 2. Required Options:
 - a. Material: Steel.
 - b. Coupling Method: Compression coupling or setscrew coupling.
- E. UL ILNR - Fittings for Type FMC Duct Raceways:
1. Listing Criteria: UL CCN ILNR; including UL 514B.
- F. UL DXAS - Fittings for Type LFMC and Type LFNC Duct Raceways:
1. Listing Criteria: UL CCN DXAS; including UL 514B.
- 2.9 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.
- 2.10 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.

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 underground conduits are intended only for use where direct buried with or without being encased in concrete. Specified Type HDPE underground conduits are not permitted to be used aboveground on Project.
- C. Outdoors:
 - 1. Exposed: ERM C.
 - 2. Concealed Aboveground: ERM C.
 - 3. Direct Buried: PVC-80 or HDPE-40.
 - 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
- D. Indoors:
 - 1. Exposed and Subject to Physical Damage: ERM C or IMC. Locations include the following:
 - a. Locations less than 2.5 m (8 ft) above finished floor.
 - b. Stub-ups to above suspended ceilings.
 - 2. Exposed and Not Subject to Physical Damage: IMC or EMT.
 - 3. Concealed in Ceilings and Interior Walls and Partitions: IMC or EMT.
 - 4. Damp or Wet Locations: ERM C, IMC, or Corrosion-resistant EMT.
 - 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC or FMC.
- E. Duct Fittings: Select fittings in accordance with NEMA FB 2.10 guidelines.
 - 1. ERM C 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-S: Article 358 of NFPA 70 and NECA NEIS 101.
 - 2. Type HDPE: Article 353 of NFPA 70 and NECA NEIS 111.

3. Type ERMC-S: Article 344 of NFPA 70 and NECA NEIS 101.
4. Type FMC-S: Article 348 of NFPA 70 and NECA NEIS 101.
5. Type IMC: Article 342 of NFPA 70 and NECA NEIS 101.
6. Type LFMC: Article 350 of NFPA 70 and NECA NEIS 101.
7. Type PVC: Article 356 of NFPA 70 and NECA NEIS 111.
8. Expansion Fittings: NEMA FB 2.40.
9. 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 (0.6 m)** above finished floor.
- c. 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.
- d. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- e. Support conduit within **12 inch (300 mm)** of enclosures to which attached.
- f. 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) Where otherwise required by NFPA 70.
- g. Do not install conduits within **2 inch (50 mm)** of the bottom side of a metal deck roof.
- h. Keep duct raceways at least **6 inch (150 mm)** away from parallel runs of flues and steam or hot-water pipes. Install horizontal duct raceway runs above water and steam piping.
- i. 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.
- j. Install pull wires in empty duct raceways. Provide polypropylene or monofilament plastic line with not less than **200 lb (90 kg)** tensile strength. Leave at least **12 inch (300 mm)** of slack at both ends of pull wire. Cap underground duct raceways designated as spare above grade alongside duct raceways in use.
- k. 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.
- l. 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 ERM 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.
3. Types FMC, LFMC, and LFNC:
 - a. Provide a minimum of 18 inches to a maximum of 36 inches of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
4. Types PVC and HDPE:
 - a. Do not install Type PVC or Type HDPE conduit where ambient temperature exceeds 122 deg F (50 deg C). 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.
5. Stub-ups to Above Recessed Ceilings:
 - a. Provide EMT, IMC, or ERM for duct raceways.
 - b. Provide a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
6. Duct Fittings: Install fittings in accordance with NEMA FB 2.10 guidelines.
 - a. EMT: Provide setscrew or compression, steel fittings. Comply with NEMA FB 2.10.
 - b. Flexible Conduit: Provide only fittings listed for use with flexible conduit type. Comply with NEMA FB 2.20.

D. Interfaces with Other Work:

1. Coordinate with Section 260529 "Hangers and Supports for Electrical Systems" for installation of conduit hangers and supports.
2. Coordinate with Section 260533.16 "Boxes and Covers for Electrical Systems" for installation of device boxes and junction boxes.

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.

END OF SECTION 260533.13

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metallic outlet boxes, device boxes, rings, and covers.
2. Junction boxes and pull boxes.
3. Cover plates for device boxes.
4. 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.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Metallic outlet boxes, device boxes, rings, and covers.
2. Junction boxes and pull boxes.
3. Cover plates for device boxes.
4. 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.

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. Required Options:
 - a. Material: Cast metal.
 - b. Luminaire Outlet Boxes and Covers: Nonadjustable, listed and labeled for attachment of luminaire weighing up to **50 lb (23 kg)**.

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.

E. UL QCIT - Metallic Device Boxes:

1. Description: Box with provisions for mounting wiring device directly to box.
2. Required Options:
 - a. Material: Cast metal.

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.

2.2 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.

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.

- D. UL BGUIZ - 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.
- E. UL BGUIZ - 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. Options:
 - a. Degree of Protection: Type 3R.
- F. UL BGUIZ - 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. Options:
 - a. Degree of Protection: Type 3R.

2.3 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.
- C. UL QCIT or QCMZ - Metallic Cover Plates for Device Boxes:
 - 1. Required 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 (0.8 mm) thick, Type 302/304 non-magnetic stainless steel with brushed finish.

2.4 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.

C. UL QCIT or QCMZ - Retractable or Reattachable Hoods for Outlet Boxes:

1. Required Options:
 - a. Provides weatherproof, "while-in-use" cover.

D. UL QCIT or QCMZ - Extra-Duty, While-in-Use Hoods for Outlet Boxes:

1. Additional Characteristics: Marked "Extra-Duty" in accordance with UL 514D.
2. Required Options:
 - a. Provides weatherproof, "while-in-use" cover.

PART 3 - EXECUTION

3.1 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. Type 3R unless otherwise indicated.
 - b. Locations Aboveground Where Mechanism Must Operate When Ice Covered: Type 3S.
 - c. Locations in-Ground or Exposed to Corrosive Agents: Type 4X.

2. Indoors:
 - a. Type 1 unless otherwise indicated.
 - b. Damp or Dusty Locations: Type 4.

C. Exposed Boxes Installed Less Than 2.5 m (8 ft) Above Floor in Public Areas:

1. Provide cast-metal boxes. Boxes with knockouts or unprotected openings are prohibited.
2. Provide exposed cover. Flat covers with angled mounting slots or knockouts are prohibited.

3.2 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 center of box unless otherwise indicated.
3. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
4. Locate boxes so that cover or plate will not span different building finishes.
5. 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.
6. Fasten junction and pull boxes to, or support from, building structure. Do not support boxes by conduits.
7. Do not install aluminum boxes, enclosures, or fittings in contact with concrete or earth.
8. 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.

3.3 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 260533.16

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PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Type HDPE raceways and fittings.
2. Type ERMC-S raceways, elbows, couplings, and nipples.
3. Type PVC raceways and fittings.
4. Fittings for conduit, tubing, and cable.
5. Electrically conductive corrosion-resistant compounds for threaded conduit.
6. Solvent cements.
7. Duct accessories.
8. Handholes and boxes for exterior underground wiring.
9. Vaults for exterior underground wiring.
10. Duct sealing.

B. Related Requirements:

1. Section 260553 "Identification for Electrical Systems" specifies underground-line warning tape.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For concrete and steel used in precast concrete vaults and handholes, also include product certificates as required by ASTM C858.

B. Shop Drawings:

1. Precast or Factory-Fabricated Concrete Structures:
 - a. Include plans, elevations, sections, and details, including attachments to other Work.
 - b. Include duct entry provisions, including locations and duct sizes, and methods and materials for waterproofing duct entry locations.
 - c. Include reinforcement details.
 - d. Include frame and cover design.
 - e. Include grounding details.
 - f. Include dimensioned locations of cable rack inserts, pulling-in and lifting irons, sumps, and other accessories.
 - g. Include joint details.

2. Factory-Fabricated Handholes and Boxes Other Than Precast Concrete:

- a. Include dimensioned plans, sections, and elevations, and fabrication and installation details.
- b. Include duct entry provisions, including locations and duct sizes, and methods and materials for waterproofing duct entry locations.
- c. Include cover design.
- d. Include grounding details.
- e. Include dimensioned locations of cable rack inserts, pulling-in and lifting irons, and other accessories.

C. Field Quality-Control Submittals:

1. Field quality-control reports.

1.3 INFORMATIONAL SUBMITTALS

A. Certificates:

1. For concrete and steel used in precast concrete vaults and handholes, as required by ASTM C858.

B. Source Quality-Control Submittals:

1. Source quality-control reports.

PART 2 - PRODUCTS

2.1 TYPE HDPE RACEWAYS AND FITTINGS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: UL 651A and UL CCN EAZX.

B. Schedule 40 Electrical HDPE Underground Conduit:

1. Dimensional Specifications: Schedule 40.
2. Required Options:
 - a. Minimum Trade Size: Metric designator 21 (trade size 3/4).

C. Schedule 80 Electrical HDPE Underground Conduit:

1. Dimensional Specifications: Schedule 80.

2. Required Options:
 - a. Minimum Trade Size: Metric designator 21 (trade size 3/4).

2.2 TYPE ERMC-S RACEWAYS, ELBOWS, COUPLINGS, AND NIPPLES

- A. Performance Criteria:
 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
 2. General Characteristics: UL 6 and UL CCN DYIX.
- B. Galvanized-Steel Electrical Rigid Metal Conduit (ERMC-S-G), Elbows, Couplings, and Nipples:
 1. Exterior Coating: Zinc.
 2. Required Options:
 - a. Interior Coating: Zinc with organic top coating.
 - b. Minimum Trade Size: Metric designator 21 (trade size 3/4).

2.3 TYPE PVC RACEWAYS AND FITTINGS

- A. Performance Criteria:
 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
 2. General Characteristics: UL 651 and UL CCN DZYR.
- B. Schedule 40 Rigid PVC Conduit (PVC-40) and Fittings:
 1. Dimensional Specifications: Schedule 40.
 2. Required Options:
 - a. Minimum Trade Size: Metric designator 21 (trade size 3/4).
- C. Schedule 80 Rigid PVC Conduit (PVC-80) and Fittings:
 1. Dimensional Specifications: Schedule 80.
 2. Required Options:
 - a. Minimum Trade Size: Metric designator 21 (trade size 3/4).

2.4 FITTINGS FOR CONDUIT, TUBING, AND CABLE

- A. Performance Criteria:
 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

B. Metallic Fittings for Type ERMC, Type PVC, and Type HDPE Raceways:

1. General Characteristics: UL 514B and UL CCN DWTT.
2. Required Options:
 - a. Material: Steel.

2.5 ELECTRICALLY CONDUCTIVE CORROSION-RESISTANT COMPOUNDS FOR THREADED CONDUIT

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: UL Subject 2419 and UL CCN FOIZ.

2.6 SOLVENT CEMENTS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: As recommended by conduit manufacturer in accordance with UL 514B and UL CCN DWTT.

B. Solvent Cements for Type PVC Raceways and Fittings:

2.7 DUCT ACCESSORIES

- A. Duct Spacers: Factory-fabricated, rigid, PVC interlocking spacers; sized for type and size of duct with which used, and selected to provide minimum duct spacing indicated while supporting duct during concreting or backfilling.

2.8 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics:
 - a. ASTM C858 for design and manufacturing processes.
 - b. SCTE 77.

B. Source Quality Control:

1. Precast Concrete Utility Structures: Test and inspect in accordance with ASTM C1037.

2. Polymer Concrete and Nonconcrete Handhole and Pull-Box Prototypes: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests must be for specified tier ratings of products supplied. Testing machine pressure gages must have current calibration certification, complying with ISO 9000 and ISO 10012, and traceable to NIST standards.
 - a. Strength tests of complete boxes and covers must be by independent testing agency or manufacturer. Qualified registered professional engineer must certify tests by manufacturer.

C. Precast Concrete Handholes and Boxes:

1. Description: Factory-fabricated, reinforced-concrete, monolithically poured walls and bottom unless open-bottom enclosures are indicated. Frame and cover must form top of enclosure and must have load rating consistent with that of handhole or box.
2. Configuration: Units must be designed for flush burial and have open bottom unless otherwise indicated.
3. Frame and Cover:
 - a. Weatherproof cast-iron frame, with cast-iron cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing bolts.
 - b. Cover Finish: Nonskid finish must have minimum coefficient of friction of 0.50.
 - c. Cover Legend: Molded lettering, "ELECTRIC".
4. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at installation location with ground-water level at grade.

D. Polymer Concrete Handholes and Boxes with Polymer Concrete Cover:

1. Description: Molded of sand, concrete, and aggregate, bound together with polymer resin, and reinforced with steel or fiberglass or combination.
2. Configuration: Units must be designed for flush burial and have open bottom unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and installed location.
 - a. Cover Finish: Nonskid finish must have minimum coefficient of friction of 0.50.
 - b. Cover Legend: Molded lettering, "ELECTRIC".
4. Conduit Entrance Provisions: Conduit-terminating fittings must mate with entering ducts for secure, fixed installation in enclosure wall.

2.9 VAULTS FOR EXTERIOR UNDERGROUND WIRING

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

2. General Characteristics:
 - a. ASTM C858 for design and manufacturing processes.
 - b. SCTE 77.

B. Precast Concrete Vaults:

1. Description: One-piece units and units with interlocking mating sections, complete with accessories, hardware, and features.
2. Knockout Panels: Precast openings in walls, arranged to match dimensions and elevations of approaching duct, plus additional **12 inch (300 mm)** vertically and horizontally to accommodate alignment variations.
3. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at installation location with ground-water level at grade.
4. Source Quality Control: Test and inspect in accordance with ASTM C1037.

2.10 DUCT SEALING

- A. Duct-Sealing Compound: Nonhardening, safe for contact with human skin, not deleterious to cable insulation, and workable at temperatures as low as **35 deg F (2 deg C)**. Compound must be capable of withstanding temperature of **300 deg F (150 deg C)** without slump and adhering to clean surfaces of plastic ducts, metallic conduit, conduit and duct coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and common metals. Duct sealing compound must be removable without damaging ducts or cables.
- B. Inflatable Duct-Sealing System: Wraparound inflatable bladder that seals ducts that are empty or containing conductors against air and water infiltration. System is suitable for use in steel, plastic, or concrete ducts and penetrations.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate layout and installation of duct, duct bank, vaults, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in field. Notify Architect if there is conflict between areas of excavation and existing structures or archaeological sites to remain.
- B. Coordinate elevations of duct and duct-bank entrances into vaults, handholes, and boxes with final locations and profiles of duct and duct banks, as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations as required to suit field conditions and to ensure that duct and duct bank will drain to manholes and handholes, and as approved by Architect.

3.2 SELECTION OF UNDERGROUND DUCTS

- A. Duct for Electrical Feeders: PVC-80 or HDPE-40, direct buried unless otherwise indicated.

- B. Duct for Electrical Branch Circuits: PVC-80 or HDPE-40, direct buried unless otherwise indicated.
- C. Underground Ducts Crossing Paved Paths and Driveways: ERMC-S, direct buried.
- D. Stub-ups: ERMC-S with a minimum of 5 feet of horizontal length below grade.

3.3 SELECTION OF UNDERGROUND ENCLOSURES

- A. Handholes and Boxes:
 - 1. Units in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Precast concrete, AASHTO HB 17, H-10 or Polymer concrete, SCTE 77, Tier 15 structural load rating.
 - 2. Units in Sidewalk and Similar Applications with Safety Factor for Nondeliberate Loading by Vehicles: Precast concrete, AASHTO HB 17, H-10 or Polymer concrete units, SCTE 77, Tier 8 structural load rating.
 - 3. Units Subject to Light-Duty Pedestrian Traffic Only: Polymer concrete units, SCTE 77, Tier 8 structural load rating.
 - 4. Cover design load must not exceed load rating of handhole or box.
- B. Vaults: Precast concrete.
 - 1. Units Not Located in Deliberate Traffic Paths by Heavy or Medium Vehicles: H-10 load rating in accordance with AASHTO HB 17.

3.4 EARTHWORK

- A. Excavation and Backfill: Comply with Section 312001 "Excavation and Embankment," but do not use heavy-duty, hydraulic-operated, compaction equipment.
- B. Restoration: Restore area after construction vehicle traffic in immediate area is complete.
- C. Restore surface features at areas disturbed by excavation, and re-establish original grades unless otherwise indicated. Replace removed sod immediately after backfilling is completed.
- D. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching.
- E. Cut and patch existing pavement in path of underground duct, duct bank, and underground structures in accordance with "Cutting and Patching" Article in Section 017300 "Execution."

3.5 INSTALLATION OF DUCTS AND DUCT BANKS

A. Reference Standards:

1. Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NEMA TCB 2 for installation of underground ducts and duct banks.
2. Consult Architect for resolution of conflicting requirements.

B. Special Techniques:

1. Steel raceway, bends, and fittings in on Project must be of same type.
2. Slope: Pitch duct minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope duct from high point between two manholes to drain in both directions.
3. Curves and Bends:
 - a. Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with minimum radius of **48 inch (1200 mm)**, both horizontally and vertically, at other locations unless otherwise indicated.
 - b. Field bending must be in accordance with NFPA 70 minimum radii requirements, except bends over 45 degrees must be made with minimum radius of **48 inch (1200 mm)**. Use only equipment specifically designed for material and size involved. Use PVC heating bender for bending PVC conduit.
4. Joints: Use solvent-cemented joints in nonmetallic duct and fittings and make watertight in accordance with manufacturer's published instructions. Stagger couplings so those of adjacent duct do not lie in same plane. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with minimum **3 inch (75 mm)** of concrete for minimum of **12 inch (300 mm)** on each side of coupling.
 - a. Install insulated grounding bushings on steel raceway terminations that are less than **12 inch (300 mm)** below grade or floor level and do not terminate in hubs.
5. Sealing: Provide temporary closure at terminations of duct with pulled cables. Seal spare duct at terminations. Use sealing compound and plugs to withstand at least **15 psig (1.03 MPa)** hydrostatic pressure.
6. Pulling Cord: Install **200 lbf (1000 N)** test nylon cord in empty ducts.
7. Direct-Buried Duct and Duct Bank:
 - a. Excavate trench bottom to provide firm and uniform support for duct. Comply with requirements in Section 312002 "Trenching" for preparation of trench bottoms for pipes less than **6 inch (150 mm)** in nominal diameter.
 - b. Width: Excavate trench **3 inch (75 mm)** wider than duct on each side.
 - c. Support ducts on duct spacers coordinated with duct size, duct spacing, and outdoor temperature.
8. Ground ducts and duct banks in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

3.6 INSTALLATION OF CONCRETE MANHOLES, HANDHOLES, AND BOXES

A. Reference Standards:

1. Precast Concrete Handholes: Comply with ASTM C891 unless otherwise indicated.
2. Consult Architect for resolution of conflicting requirements.

B. Special Techniques:

1. Precast Concrete Handholes and Vaults:
 - a. Install units level and plumb and with orientation and depth coordinated with connecting duct to minimize bends and deflections required for proper entrances.
 - b. Unless otherwise indicated, support units on level bed of crushed stone or gravel graded from **1 inch (25 mm)** sieve to **No. 4 (4.75 mm)** sieve and compacted to same density as adjacent undisturbed earth.
 - c. Field-cut openings for conduits in accordance with enclosure manufacturer's published instructions. Cut wall of enclosure with tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.
2. Elevations:
 - a. Vault Frame: In paved areas and trafficways, set frames flush with finished grade. Set other manhole frames **1 inch (25 mm)** above finished grade.
 - b. Handhole Covers: In paved areas and trafficways, set surface flush with finished grade. Set covers of other handholes **1 inch (25 mm)** above finished grade.
 - c. Where indicated, cast handhole cover frame integrally with handhole structure.
3. Drainage: Install drains in bottom of vaults where indicated. Coordinate with drainage provisions indicated.
4. Hardware: Install removable hardware, including pulling eyes, cable stanchions, and cable arms, as required for installation and support of cables and conductors and as indicated.
5. Field-Installed Bolting Anchors in Vaults and Concrete Handholes: Do not drill deeper than **3-7/8 inch (97 mm)** for vaults and **2 inch (50 mm)** for handholes, for anchor bolts installed in field. Use minimum of two anchors for each cable stanchion.
6. Ground vaults, handholes, and boxes in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

3.7 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Demonstrate capability and compliance with requirements on completion of installation of underground duct, duct bank, and utility structures.
2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide minimum **12 inch (300 mm)** long mandrel equal to duct size minus **1/4 inch (6 mm)**. If obstructions are indicated, remove obstructions and retest.

3. Test manhole and handhole grounding to ensure electrical continuity of grounding and bonding connections.
- B. Nonconforming Work:
1. Underground ducts, raceways, and structures will be considered defective if they do not pass tests and inspections.
 2. Correct deficiencies and retest as specified above to demonstrate compliance.
- C. Assemble and submit test and inspection reports.

END OF SECTION 260543

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Labels.
2. Extruded insulating tubing.
3. Bands.
4. Tapes.
5. Tags.
6. Signs.
7. Cable ties.

1.2 ACTION SUBMITTALS

A. Product data.

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.

C. UL PGDQ2 - Self-Adhesive Wraparound Labels: Preprinted, 3 mil thick, vinyl flexible label with acrylic pressure-sensitive adhesive.

1. 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.
2. Marker for Labels:
 - a. 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. Minimum Nominal Size:
 - a. 3-1/2 by 5 inch for equipment.

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 TAPES

- A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
- B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mil thick by 1 to 2 inch wide; compounded for outdoor use.
- C. Tape: 4 inch wide black stripes on 10 inch centers placed diagonally over orange background and are 12 inch wide. Stop stripes at legends.
- D. Underground-Line Warning Tape:
 - 1. Tape:
 - a. Recommended by manufacturer for method of installation and suitable to identify and locate underground electrical utility lines.
 - b. Printing on tape must be permanent and may not be damaged by burial operations.
 - c. Tape material and ink must be chemically inert and not be subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.
 - 2. Color and Printing:
 - a. Comply with APWA Uniform Color Code using NEMA Z535.1 safety colors.
 - b. Inscriptions for Red Tapes: "CAUTION BURIED ELECTRIC LINE BELOW".

3. Detectable Line-Warning Tape:

- a. Detectable three-layer laminate, consisting of printed pigmented polyolefin film, solid aluminum-foil core, and clear protective film that allows inspection of continuity of conductive core; bright colored, continuous-printed on one side with inscription of utility, compounded for direct-burial service.
- b. Width: 3 inch.
- c. Overall Thickness: 5 mil.
- d. Foil Core Thickness: 0.35 mil.
- e. Weight: 28 lb/1000 sq. ft.
- f. Tensile in accordance with ASTM D882: 70 lbf and 4600 psi.

2.4 TAGS

A. Write-on Tags:

1. Polyester Tags: 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment.
2. Marker for Tags:
 - a. Permanent, waterproof, black ink marker recommended by tag manufacturer.

2.5 SIGNS

A. Laminated Acrylic or Melamine Plastic Signs:

1. Engraved legend.
2. Thickness:
 - a. For signs up to 20 sq. inch, minimum 1/16 inch thick.
 - b. For signs larger than 20 sq. inch, 1/8 inch thick.
 - c. Engraved legend with white letters on dark gray background.
 - d. Punched or drilled for mechanical fasteners.
 - e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.6 CABLE TIES

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 ZODZ; including UL 1565 or UL 62275.

- B. 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.
- C. 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.

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. Color-Coding for Phase- and Voltage-Level Identification, 1000 V or Less: Use colors listed below for ungrounded 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. Color for Neutral (Grounded Conductor): White.
 4. Color for Equipment Ground: Green.
- B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.
- C. Locations of Underground Lines: Underground-line warning tape for power cable.
- D. 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 or self-adhesive vinyl tape to identify phase.
- E. Equipment Identification Labels:

1. White letters on dark field.
2. Indoor Equipment: Laminated acrylic.
3. Outdoor Equipment: Laminated acrylic.
4. Equipment to Be Labeled:
 - a. Panelboards: Typewritten directory of circuits in location provided by panelboard manufacturer. Panelboard identification must be in form of engraved, laminated acrylic or melamine label.
 - b. Enclosures and electrical cabinets.
 - c. Access doors and panels for concealed electrical items.
 - d. Enclosed switches.
 - e. Contactors.
 - f. Battery-inverter units.

3.3 SELECTION OF SIGNS AND HAZARD MARKINGS

- A. Comply with 29 CFR 1910.145 for danger, caution, warning, and safety instruction signs.
- B. Electrical Hazard Warnings:
 1. Arc-Flash Hazard Warning: Self-adhesive labels. Comply with NFPA 70E requirements for arc-flash hazard warning labels.
- C. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive labels.
 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.
- D. Operating Instruction Signs: Self-adhesive labels, or laminated acrylic or melamine plastic signs.

3.4 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. Fasteners for Labels and Signs: Self-tapping, stainless steel screws or stainless steel machine screws with nuts and flat and lock washers.
- C. 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.
- D. Install identifying devices before installing acoustical ceilings and similar concealment.

- E. Verify identity of item before installing identification products.
- F. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.
- G. Apply identification devices to surfaces that require finish after completing finish work.
- H. System Identification for Raceways and Cables under 1000 V: Identification must completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.
 - 1. Secure tight to surface of conductor, cable, or raceway.
- I. 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.
- J. Self-Adhesive Wraparound Labels: Secure tight to surface at location with high visibility and accessibility.
- K. Self-Adhesive Labels:
 - 1. Install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
 - 2. Unless otherwise indicated, provide single line of text with 1/2 inch high letters on 1-1/2 inch high label; where two lines of text are required, use labels 2 inch high.
- L. Heat-Shrink, Preprinted Tubes: Secure tight to surface at location with high visibility and accessibility.
- M. Marker Tapes: Secure tight to surface at location with high visibility and accessibility.
- N. 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.

- O. Underground Line Warning Tape:
 - 1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inch below finished grade. Use multiple tapes where width of multiple lines installed in common trench exceeds 16 inch overall.
 - 2. Install underground-line warning tape for direct-buried cables and cables in raceways.

- P. Write-on Tags:
 - 1. Place in location with high visibility and accessibility.
 - 2. Secure using cable ties.

- Q. Laminated Acrylic or Melamine Plastic Signs:
 - 1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to location and substrate.
 - 2. Unless otherwise indicated, provide single line of text with 1/2 inch high letters on 1-1/2 inch high sign; where two lines of text are required, use labels 2 inch high.

- R. Cable Ties: General purpose, for attaching tags, except as listed below:
 - 1. Outdoors: UV-stabilized nylon.

END OF SECTION 260553

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PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Outdoor photoelectric switches, solid state, flexible mounting.
2. Indoor occupancy sensors.
3. Lighting contactors.
4. Conductors and cables.

B. Related Requirements:

1. Section 262726 "Wiring Devices" for manual light switches.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.

B. Shop Drawings:

1. Show installation details for the following:
 - a. Occupancy sensors.
2. Interconnection diagrams showing field-installed wiring.
3. Include diagrams for power, signal, and control wiring.

C. Field quality-control reports.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each type of lighting control device to include in operation and maintenance manuals.

1.4 WARRANTY

- A. Manufacturer's Warranty: Manufacturer and Installer warrant that installed lighting control devices perform in accordance with specified requirements and agree to repair or replace lighting control devices that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Faulty operation of lighting control devices.
 2. Extended Warranty Period: Two year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 OUTDOOR PHOTOELECTRIC SWITCHES, SOLID STATE, FLEXIBLE MOUNTING

- A. Description: Solid state, with SPST dry contacts rated for 600VA minimum LED, to operate connected relay, contactor coils, or microprocessor input; complying with UL 773A, and compatible with drivers and LED lamps.
1. Listed and labeled in accordance with NFPA 70, by a qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 2. Light-Level Monitoring Range: 1.5 to 10 fc (16.14 to 108 lx), with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of the photocell to prevent fixed light sources from causing turn-off.
 3. Time Delay: Fifteen-second minimum, to prevent false operation.
 4. Surge Protection: Metal-oxide varistor.
 5. Mounting: Twist lock complies with ANSI C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the north sky exposure.
 6. Failure Mode: Luminaire stays ON.

2.2 INDOOR OCCUPANCY SENSORS

- A. General Requirements for Sensors:
1. Wall- or ceiling-mounted, solid-state indoor occupancy sensors.
 2. Dual technology.
 3. Hardwired connection to switch.
 4. Listed and labeled in accordance with NFPA 70, by a qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

5. 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.
 6. Power Pack: Dry contacts rated for 20 A LED load at 120 and 277 V(ac), and for 1 hp at 120 V(ac). Sensor has 24 V(dc), 150 mA, Class 2 power source.
 7. Mounting:
 - a. Sensor: Suitable for mounting in any position in a standard device box or outlet box.
 - b. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
 8. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
 9. Bypass Switch: Override the "on" function in case of sensor failure.
- B. 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 (150 mm)** minimum movement of any portion of a human body that presents a target of not less than **36 sq. inch (23 200 sq. mm)**, and detect a person of average size and weight moving not less than **12 inch (305 mm)** in either a horizontal or a vertical manner at an approximate speed of **12 inch/s (305 mm/s)**.
 3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of **1000 sq. ft. (93 sq. m)** when mounted on a **96 inch (2440 mm)** high ceiling.

2.3 LIGHTING CONTACTORS

- A. Description: Electrically operated and mechanically held, combination-type lighting contactors with nonfused disconnect, complying with NEMA ICS 2 and UL 508.
1. Current Rating for Switching: Listing or rating consistent with type of load served.
 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 and pilot devices as indicated on Drawings, matching the NEMA type specified for the enclosure.

2.4 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. 22 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 INSTALLATION OF SENSORS

- A. 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.
- B. 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.

3.2 INSTALLATION OF CONTACTORS

- A. Comply with NECA 1.

3.3 INSTALLATION OF WIRING

- A. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is **1/2 inch (13 mm)**.
- B. Wiring within Enclosures: Separate power-limited and nonpower-limited conductors in accordance with conductor manufacturer's instructions.
- C. Size conductors in accordance with lighting control device manufacturer's instructions unless otherwise indicated.
- D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, device, and outlet boxes; terminal cabinets; and equipment enclosures.

3.4 IDENTIFICATION

- A. Identify components and power and control wiring in accordance with Section 260553 "Identification for Electrical Systems.
- B. Label contactors with a unique designation.

3.5 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 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.

B. Nonconforming Work:

1. Lighting control devices will be considered defective if they do not pass tests and inspections.
2. Remove and replace defective units and retest.

C. Prepare test and inspection reports.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting lighting control devices to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.

END OF SECTION 260923

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PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Power panelboards.
2. Lighting and appliance branch-circuit panelboards.
3. Disconnecting and overcurrent protective devices.
4. Panelboard enclosure heaters.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Power panelboards.
2. Lighting and appliance branch-circuit panelboards.
3. Disconnecting and overcurrent protective devices.
4. Panelboard enclosure heaters.
5. Include materials, switching and overcurrent protective devices, SPDs, accessories, and components indicated.
6. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details.
2. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
6. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards.

1.3 INFORMATIONAL SUBMITTALS

A. Panelboard Schedules: For installation in panelboards.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For panelboards and components to include operation and maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish to Owner two spare keys for each type of panelboard cabinet lock.

1.6 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within the specified warranty period.
 - 1. Warranty Period: 18 months from date of Substantial Completion; full coverage for labor, materials, and equipment.

PART 2 - PRODUCTS

2.1 PANELBOARDS COMMON REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70, by qualified electrical testing agency recognized by authorities having jurisdiction, and marked for intended location and application.
- B. Comply with NEMA PB 1.
- C. Comply with NFPA 70.
- D. Enclosures: Flush and Surface-mounted, dead-front cabinets.
 - 1. Rated for environmental conditions at installed location.
 - a. Indoor Dry and Clean Locations: UL 50E, Type 1.
 - b. Outdoor Locations: UL 50E, Type 3R.
 - c. Other Wet or Damp Indoor Locations: UL 50E, Type 4.
 - 2. Height: 7 ft maximum.
 - 3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims must cover live parts and may have no exposed hardware.
- E. Incoming Mains:
 - 1. Location: Convertible between top and bottom.
- F. Phase, Neutral, and Ground Buses:
 - 1. Material: Hard-drawn copper, 98 percent conductivity.
- G. Conductor Connectors: Suitable for use with conductor material and sizes.
 - 1. Material: Tin-plated aluminum.

2. Main and Neutral Lugs: Mechanical type, with lug on neutral bar for each pole in panelboard.
 3. Ground Lugs and Bus-Configured Terminators: Mechanical type, with lug on bar for each pole in panelboard.
- H. Quality-Control Label: Panelboards or load centers must be labeled, by qualified electrical testing laboratory recognized by authorities having jurisdiction, for use as service equipment with one or more main service disconnecting and overcurrent protective devices. Panelboards or load centers must have meter enclosures, wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.
- I. Panelboard Short-Circuit Current Rating:
1. Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed, by qualified electrical testing laboratory recognized by authorities having jurisdiction, for 100 percent interrupting capacity.

2.2 POWER PANELBOARDS

- A. Listing Criteria: NEMA PB 1, distribution type.
- B. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
1. For doors more than 36 inch high, provide two latches, keyed alike.
- C. Mains: Circuit breaker.
- D. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
- E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Listing Criteria: NEMA PB 1, lighting and appliance branch-circuit type.
- B. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- C. Doors: Door-in-door construction with concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. MCCB: Comply with UL 489, with series-connected rating or interrupting capacity to meet available fault currents.
 - 1. Thermal-Magnetic Circuit Breakers:
 - a. Inverse time-current element for low-level overloads.
 - b. Instantaneous magnetic trip element for short circuits.
 - c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 - 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
 - 3. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6 mA trip).
 - 4. GFEP Circuit Breakers: Class B ground-fault protection (30 mA trip).
 - 5. MCCB Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Breaker handle indicates tripped status.
 - c. UL listed for reverse connection without restrictive line or load ratings.

2.5 PANELBOARD ENCLOSURE HEATERS

- A. Listing: Comply with UL 499.
- B. Heater: Vulcanized fiberglass-reinforced silicone rubber with metallic resistive heating element.
 - 1. Single-phase 120 volt or 208 volt.
 - 2. Operating temperature -40 degrees F to 350 degrees F.
 - 3. Integral thermostat; setpoint 40-60 degrees F.
 - 4. Wattage as shown in plans.
- C. Mounting: Heater attached to aluminum mounting plate at factory or with adhesive listed for the purpose.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

- B. Comply with manufacturer's published instructions.
- C. Reference Standards:
 - 1. Panelboards: Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NECA 407 and NEMA PB 1.1.
- D. Special Techniques:
 - 1. Mount panelboards such that the operating handle of the top-most switch or circuit breaker, in on position, is not higher than 79 inches above finished floor unless otherwise indicated.
 - 2. Mount panelboard cabinet plumb and rigid without distortion of box.
 - 3. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
 - 4. Install overcurrent protective devices and controllers not already factory installed.
 - a. Set field-adjustable, circuit-breaker trip ranges.
 - 5. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.
 - 6. Install filler plates in unused spaces.
 - 7. Mount panelboard heater in interior of any outdoor panel with adjustable circuit breakers. Mount according to manufacturer's instructions.

3.2 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."
- B. Panelboard Nameplates: Label each panelboard with nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- C. Device Nameplates: Label each branch circuit device in power panelboards with nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- D. Install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems" identifying source of remote circuit.
- E. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles must be located on interior of panelboard door.
- F. Breaker Labels: Faceplate must list current rating, UL and IEC certification standards, and AIC rating.
- G. Circuit Directory:

1. Create directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.

3.3 FIELD QUALITY CONTROL

A. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

B. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NETA ATS, Paragraph 7.6 Circuit Breakers. Perform optional tests. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

C. Nonconforming Work:

1. Panelboards will be considered defective if they do not pass tests and inspections.
2. Remove and replace defective units and retest.

D. Collect, assemble, and submit test and inspection reports, including certified report that identifies panelboards included and that describes scanning results, with comparisons of two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 262416

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cabinets and cutout boxes.
2. Termination boxes.
3. Miscellaneous enclosures.

B. Products Installed, but Not Furnished, under This Section:

1. See Section 260553 "Identification for Electrical Systems" for equipment labels.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Cabinets and cutout boxes.
2. Termination boxes.
3. Miscellaneous enclosures.

B. Shop Drawings:

1. Shop drawings for custom enclosures and cabinets.

1.3 INFORMATIONAL SUBMITTALS

A. Manufacturers' Published Instructions:

1. Cabinets and cutout boxes.
2. Termination boxes.
3. Miscellaneous enclosures.

PART 2 - PRODUCTS

2.1 CABINETS AND CUTOUT BOXES

A. 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. UL CCN CYIV.
- b. Non-Environmental Characteristics: UL 50.
- c. Environmental Characteristics: 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 CYIV - Indoor Sheet Metal Cabinets:

1. General Characteristics: Enclosure provided with frame, mat, or trim in which swinging door or doors are or can be hung.
2. Options:
 - a. Degree of Protection: Type 1.

D. UL CYIV - Indoor Sheet Metal Cutout Boxes:

1. General Characteristics: Enclosure that has swinging doors or covers secured directly to and telescoping with walls of enclosure.
2. Options:
 - a. Degree of Protection: Type 1.

E. UL CYIV - Outdoor Sheet Metal Cabinets:

1. General Characteristics: Enclosure provided with frame, mat, or trim in which swinging door or doors are or can be hung.
2. Options:
 - a. Degree of Protection: Type 3R.

- F. UL CYIV - Outdoor Sheet Metal Cutout Boxes:
 - 1. General Characteristics: Enclosure that has swinging doors or covers secured directly to and telescoping with walls of enclosure.
 - 2. Options:
 - a. Degree of Protection: Type 3R.

2.2 TERMINATION BOXES

- A. Description: Enclosure for termination base consisting of lengths of bus bars, terminal strips, or terminal blocks with provision for wire connectors to accommodate incoming or outgoing conductors or both.
- 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. UL CCN XCKT; including UL 1773.
 - b. Non-Environmental Characteristics: UL 50.
 - c. Environmental Characteristics: UL 50E.
- C. Source Quality Control:
 - 1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
- D. UL XCKT - Termination Boxes and Termination Bases for Installation on Line Side of Service Equipment:
 - 1. Additional Characteristics: Listed and labeled for installation on line side of service equipment.
 - 2. Options:
 - a. Indoor Degree of Protection: Type 1.
 - b. Outdoor Degree of Protection: Type 3R.
- E. UL XCKT - Termination Boxes and Termination Bases for Installation on Load Side of Service Equipment:
 - 1. Additional Characteristics: Listed and labeled for installation on load side of service equipment.
 - 2. Options:

- a. Indoor Degree of Protection: Type 1.
- b. Outdoor Degree of Protection: Type 3R.

2.3 MISCELLANEOUS ENCLOSURES

A. 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. UL CCN XCKT; including UL 1773.
- b. Non-Environmental Characteristics: UL 50.
- c. Environmental Characteristics: 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.

C. UL XCKT - Indoor Sheet Metal Miscellaneous Enclosures:

1. Options:

- a. Degree of Protection: Type 1.

D. UL XCKT - Outdoor Sheet Metal Miscellaneous Enclosures:

1. Options:

- a. Degree of Protection: Type 3R.

PART 3 - EXECUTION

3.1 PREPARATION

A. Shop Drawings: Prepare and submit the following:

- 1. Shop Drawings for Custom Enclosures and Cabinets: Include plans, elevations, sections, and attachment details.

3.2 SELECTION OF ELECTRICAL CABINETS AND ENCLOSURES

- A. Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with NFPA 70 for selection of electrical cabinets and enclosures. Consult Architect for resolution of conflicting requirements.

3.3 INSTALLATION OF ELECTRICAL CABINETS AND ENCLOSURES

- 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. Cabinets and Cutout Boxes: Article 312 of NFPA 70.
- C. Special Installation Techniques:
 - 1. Mount cabinets and enclosures at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
 - 2. Do not install cabinets, enclosures, or fittings in contact with concrete or earth.
 - 3. 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.
 - 4. Identification: Provide labels for cabinets, enclosures, and associated electrical equipment.
 - a. Identify field-installed conductors, interconnecting wiring, and components.
 - b. Provide warning signs.
 - c. Label each cabinet or enclosure with laminated-plastic nameplate.

3.4 PROTECTION

- A. Protect coatings and finishes of cabinets, enclosures, and racks 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 262716

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PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. General-use switches.
2. General-grade duplex straight-blade receptacles.
3. Receptacles with ground-fault protective devices.
4. Wall plates.

B. Related Requirements:

1. Section 260923 "Lighting Control Devices" for occupancy sensors.

1.2 ACTION SUBMITTALS

A. Product Data:

1. General-use switches.
2. General-grade duplex straight-blade receptacles.
3. Receptacles with ground-fault protective devices.
4. Wall plates.

B. Field quality-control reports.

1.3 INFORMATIONAL SUBMITTALS

A. Manufacturers' Instructions: Record copy of official installation instructions issued to Installer by manufacturer for the following:

1. Receptacles with GFCI devices.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include all manufacturers' packing-label warnings and instruction manuals that include labeling conditions

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Items: Furnish extra materials to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Extra Keys for Key Lock Switches: Two of each kind.

PART 2 - PRODUCTS

2.1 GENERAL-USE SWITCHES

- A. Toggle Switch:
 - 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. General Characteristics:
 - a. Reference Standards: UL CCN WMUZ and UL 20.
 - 3. Options:
 - a. Device Color: As indicated on architectural Drawings.
 - b. Configuration:
 - 1) Heavy-duty, 120-277 V, 20 A, single pole.
- B. Toggle Switch with Forked Key Lock:
 - 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. General Characteristics:
 - a. Reference Standards: UL CCN WMUZ and UL 20.
 - 3. Options:
 - a. Device Color: As indicated on architectural Drawings.
 - b. Configuration:
 - 1) 120-277 V, 20 A, single pole.

2.2 GENERAL-GRADE DUPLEX STRAIGHT-BLADE RECEPTACLES

A. Duplex Straight-Blade Receptacle:

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. General Characteristics:

- a. Reference Standards: UL CCN RTRT and UL 498.

3. Options:

- a. Device Color: As indicated on architectural Drawings.
- b. Configuration:
 - 1) Heavy-duty, NEMA 5-20R.

2.3 RECEPTACLES WITH GROUND-FAULT PROTECTIVE DEVICES

A. General-Grade, Tamper-Resistant Duplex Straight-Blade Receptacle with GFCI Device:

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. General Characteristics:

- a. Reference Standards: UL CCN KCXS, UL 498, UL 943.

3. Options:

- a. Device Color: As indicated on architectural Drawings.
- b. Configuration: Heavy-duty, NEMA 5-20R.

B. General-Grade, Weather-Resistant, Tamper-Resistant Duplex Straight-Blade Receptacle with GFCI Device:

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. General Characteristics:
 - a. Reference Standards: UL CCN KCXS, UL 498, and UL 943.
 3. Options:
 - a. Device Color: As indicated on architectural Drawings.
 - b. Configuration: Heavy-duty, NEMA 5-20R.
- C. General-Grade, Weather-Resistant, Tamper-Resistant Duplex Straight-Blade Receptacle with GFCI Device and USB Outlet to Power Class 2 Equipment:
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. General Characteristics:
 - a. Reference Standards: UL CCN RTRT, UL CCN KCXS, UL 498, and UL 943.
 3. Options:
 - a. Device Color: As indicated on architectural Drawings.
 - b. Configuration:
 - 1) General-duty, NEMA 5-20R; one USB-A port; one USB-C port.

2.4 WALL PLATES

- A. Single Source: Obtain wall plates from same manufacturer of wiring devices.
- B. Single and combination types shall match corresponding wiring devices.
 1. Plate-Securing Screws: Metal with head color to match plate finish.
 2. Material for Finished Spaces: 0.035-inch-thick, satin-finished, Type 302 stainless steel.
 3. Material for Unfinished Spaces: Galvanized steel.
 4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.
- C. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, “extra duty” die-cast aluminum while-in-use with lockable cover.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's instructions.
- B. Reference Standards:
 - 1. Unless more stringent requirements are specified in Contract Documents or manufacturers' instructions, comply with installation instructions in NECA NEIS 130.
 - 2. Mounting Heights: Unless otherwise indicated in Contract Documents, comply with mounting heights recommended in NECA NEIS 1.
 - 3. Receptacle Orientation: Unless otherwise indicated in Contract Documents, orient receptacle to match configuration diagram in NEMA WD 6.
- C. Identification:
 - 1. Identify cover or cover plate for device with panelboard identification and circuit number in accordance with Section 260553 "Identification for Electrical Systems."
- D. Coordination with Other Trades:
 - 1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes, and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
 - 2. 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.
 - 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
 - 4. Install wiring devices after all wall preparation, including painting, is complete.
- E. Conductors:
 - 1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
 - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
 - 3. The length of free conductors at outlets for devices shall comply with NFPA 70, Article 300, without pigtails.
 - 4. Existing Conductors:
 - a. Cut back and pigtail, or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.
- F. Device Installation:
 - 1. Replace devices that have been in temporary use during construction and that 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 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A 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.

G. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.

H. 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.

I. 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.

3.2 FIELD QUALITY CONTROL OF SWITCHES

A. Tests and Inspections:

1. Perform tests and inspections in accordance with manufacturers' instructions.

B. Nonconforming Work:

1. Unit will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective units and retest.

C. Assemble and submit test and inspection reports.

3.3 FIELD QUALITY CONTROL OF STRAIGHT-BLADE RECEPTACLES

A. Tests and Inspections:

1. Insert and remove test plug to verify that device is securely mounted.
2. Verify polarity of hot and neutral pins.
3. Measure line voltage.
4. Measure percent voltage drop.
5. Measure grounding circuit continuity; impedance must be not greater than 2 ohms.

6. Perform additional installation and maintenance inspections and diagnostic tests in accordance with NECA NEIS 130 and manufacturers' instructions.
- B. Nonconforming Work:
1. Device will be considered defective if it does not pass tests and inspections.
 2. Remove and replace defective units and retest.
- C. Assemble and submit test and inspection reports.

END OF SECTION 262726

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PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Enclosed molded-case circuit breakers (MCCBs).
2. Enclosures.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
2. Enclosure types and details for types other than UL 50E, Type 1.
3. Current and voltage ratings.
4. Short-circuit current ratings (interrupting and withstand, as appropriate).
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.

B. Field Quality-Control Submittals:

1. Field quality-control reports.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- #### A. Electrical Components, Devices, and Accessories:
- 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.

2.2 MOLDED-CASE CIRCUIT BREAKERS

- #### A. Circuit breakers must be constructed using glass-reinforced insulating material. Current carrying components must be completely isolated from handle and accessory mounting area.
- #### B. Circuit breakers must have toggle operating mechanism with common tripping of all poles, which provides quick-make, quick-break contact action. Circuit-breaker handle must be over center, be trip free, and reside in tripped position between on and off to provide local trip indication. Circuit-breaker escutcheon must be clearly marked on and off in addition to providing international I/O markings. Equip circuit breaker with push-to-trip button, located on

face of circuit breaker to mechanically operate circuit-breaker tripping mechanism for maintenance and testing purposes.

- C. Maximum ampere rating and UL, IEC, or other certification standards with applicable voltage systems and corresponding interrupting ratings must be clearly marked on face of circuit breaker. Circuit breakers must be 100 percent rated.
- D. MCCBs must be equipped with device for locking in isolated position.
- E. Standard: Comply with UL 489 with required interrupting capacity for available fault currents.
- F. Thermal-Magnetic Circuit Breakers: Inverse time-current thermal element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
- G. Electronic Trip Circuit Breakers: Field-replaceable rating plug, RMS sensing, with the following field-adjustable settings:
 - 1. Instantaneous trip.
 - 2. Long- and short-time pickup levels.
 - 3. Long- and short-time time adjustments.
- H. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.
- I. Features and Accessories:
 - 1. Standard frame sizes, trip ratings, and number of poles.
 - 2. Application Listing: Appropriate for application.

2.3 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, UL 50E, and UL 50, to comply with environmental conditions at installed location.
- B. Enclosure Finish: Enclosure must be finished with gray baked enamel paint, electrodeposited on cleaned, phosphatized galvanized steel (UL 50E Type 3R).
- C. Operating Mechanism: Circuit-breaker operating handle must be directly operable through dead front trim of enclosure (UL 50E Type 3R). Cover interlock mechanism must have externally operated override. Override may not permanently disable interlock mechanism, which must return to locked position once override is released. Tool used to override cover interlock mechanism must not be required to enter enclosure in order to override interlock.
- D. Enclosures designated as UL 50E Type 4, 4X stainless steel, 12, or 12K must have dual cover interlock mechanism to prevent unintentional opening of enclosure cover when circuit breaker is ON and to prevent turning circuit breaker ON when enclosure cover is open.

PART 3 - EXECUTION

3.1 SELECTION OF ENCLOSURES

- A. Indoor, Dry and Clean Locations: UL 50E, Type 1.
- B. Outdoor Locations: UL 50E, Type 3R.

3.2 INSTALLATION

- A. Comply with manufacturer's published instructions.
- B. Special Techniques:
 - 1. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
 - 2. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
 - 3. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

3.3 IDENTIFICATION

- A. Comply with requirements in Section 260553 "Identification for Electrical Systems."
 - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - 2. Label each enclosure with laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

- A. Tests and Inspections for Molded-Case Circuit Breakers:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
- B. Nonconforming Work:
 - 1. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
 - 2. Remove and replace defective units and retest.
- C. Collect, assemble, and submit test and inspection reports.
 - 1. Test procedures used.
 - 2. Include identification of each enclosed switch and circuit breaker tested and describe test results.

3. List deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 262816

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manual motor controllers.
2. Enclosures.
3. Accessories.
4. Identification.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For each type of magnetic controller.

1. Include plans, elevations, sections, and mounting details.
2. Indicate dimensions, weights, required clearances, and location and size of each field connection.
3. Wire Termination Diagrams and Schedules: Include diagrams for signal, and control wiring. Identify terminals and wiring designations and color-codes to facilitate installation, operation, and maintenance. Indicate recommended types, wire sizes, and circuiting arrangements for field-installed wiring, and show circuit protection features. Differentiate between manufacturer-installed and field-installed wiring.
4. Include features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

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 use.

- B. UL Compliance: Fabricate and label magnetic motor controllers to comply with UL 508 and UL 60947-4-1.
- C. NEMA Compliance: Fabricate motor controllers to comply with ICS 2.

2.2 MANUAL MOTOR CONTROLLERS

- A. Motor-Starting Switches (MSS): "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off or on.
 - 1. Standard: Comply with NEMA ICS 2, general purpose, Class A.
 - 2. Configuration: Nonreversing.
 - 3. Surface mounting.
 - 4. Red pilot light.
 - 5. Handle guard / lock-off: Accepts padlock.
- B. Fractional Horsepower Manual Controllers (FHPMC): "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off, on, or tripped.
 - 1. Configuration: Nonreversing.
 - 2. Overload Relays: Inverse-time-current characteristics; NEMA ICS 2, Class 10 tripping characteristics; heaters matched to nameplate full-load current of actual protected motor; external reset push button; bimetallic type or melting alloy type.
 - 3. Pilot Light: Red.

2.3 ENCLOSURES

- A. Comply with NEMA 250, type designations as indicated on Drawings, complying with environmental conditions at installed location.
- B. The construction of the enclosures shall comply with NEMA ICS 6.

2.4 IDENTIFICATION

- A. Controller Nameplates: Laminated acrylic or melamine plastic signs, as described in Section 260553 "Identification for Electrical Systems," for each compartment, mounted with corrosion-resistant screws.

B. Arc-Flash Warning Labels:

1. Comply with requirements in Section 260553 "Identification for Electrical Systems." Produce a 3.5-by-5-inch self-adhesive equipment label for each work location included in the analysis. Labels shall be machine printed, with no field-applied markings.
 - a. The label shall have an orange header with the wording, "WARNING, ARC-FLASH HAZARD," and shall include the following information taken directly from the arc-flash hazard analysis:
 - 1) Location designation.
 - 2) Nominal voltage.
 - 3) Flash protection boundary.
 - 4) Hazard risk category.
 - 5) Incident energy.
 - 6) Working distance.
 - 7) Engineering report number, revision number, and issue date.
 - b. Labels shall be machine printed, with no field-applied markings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Maintain minimum clearances and workspace at equipment according to manufacturer's written instructions and NFPA 70.
- C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

3.2 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.

B. Tests and Inspections:

1. Comply with the provisions of NFPA 70B, "Testing and Test Methods" Chapter.
2. Visual and Mechanical Inspection:
 - a. Compare equipment nameplate data with drawings and specifications.
 - b. Inspect physical and mechanical condition.
 - c. Inspect anchorage, alignment, and grounding.
 - d. Verify the unit is clean.
 - e. Motor-Running Protection: Verify overload element rating is correct for its application.
3. Electrical Tests:
 - a. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Insulation-resistance values shall be according to manufacturer's published data or NETA ATS Table 100.1. In the absence of manufacturer's published data, use Table 100.5. Values of insulation resistance less than those of this table or manufacturer's recommendations shall be investigated and corrected.
 - b. Test motor protection devices according to manufacturer's published data.
 - c. Perform operational tests by initiating control devices.

C. Motor controller will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.4 SYSTEM FUNCTION TESTS

- A. System function tests shall prove the correct interaction of sensing, processing, and action devices. Perform system function tests after field quality control tests have been completed and all components have passed specified tests.
1. Develop test parameters and perform tests for the purpose of evaluating performance of integral components and their functioning as a complete unit within design requirements and manufacturer's published data.
 2. Verify the correct operation of interlock safety devices for fail-safe functions in addition to design function.
 3. Verify the correct operation of sensing devices, alarms, and indicating devices.
- B. Motor controller will be considered defective if it does not pass the system function tests and inspections.
- C. Prepare test and inspection reports.

END OF SECTION 262913.03

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Luminaires.
2. Luminaire fittings.

B. Related Requirements:

1. Section 260519 "Low-Voltage Electrical Power Conductors and Cables" specifies wiring connections installed by this Section.
2. Section 260529 "Hangers and Supports for Electrical Systems" specifies channel and angle supports installed by this Section.
3. Section 260553 "Identification for Electrical Systems" specifies electrical equipment labels and warning signs installed by this Section.
4. Section 260923 "Lighting Control Devices" specifies automatic control of lighting, including occupancy sensors and lighting relays and contactors installed by this Section.

1.2 DEFINITIONS

- A. Correlated Color Temperature (CCT): The absolute temperature (in kelvins) of a blackbody whose chromaticity (color quality) most nearly resembles that of the light source.
- B. 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.

1.3 ACTION SUBMITTALS

A. Product Data:

1. For luminaires.
 - a. Include schedule of submitted lighting products. Arrange schedule and accompanying product data in order by luminaire and lamp designations indicated on Drawings.
 - b. Include data on features, accessories, and finishes.
 - c. Include physical description and dimensions of luminaires.
 - d. Include battery and charger data for emergency lighting units.
 - e. Include life, output (lumens, CCT, and CRI), and energy-efficiency data.
 - f. Include manufacturer's sample warranty language.
2. For luminaire fittings.

- a. Include schedule of submitted lighting products. Arrange schedule and accompanying product data in order by luminaire and lamp designations indicated on Drawings.
- b. Include manufacturer's sample warranty language.

B. Field quality-control reports.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturers' published instructions.

1.5 CLOSEOUT SUBMITTALS

A. Warranty documentation.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect exposed surface finishes on lighting equipment by applying strippable, temporary protective covering before shipping.

1.7 WARRANTY FOR LUMINAIRES

A. Warranty: Manufacturer and Installer agree to repair or replace products that fail in materials and workmanship within specified warranty period. Warranty must convey to Owner upon acceptance of the Work.

1. Warranty Period: Five years from date of Substantial Completion; full coverage for labor, materials, and equipment.

1.8 WARRANTY FOR BATTERIES

A. Special Manufacturer Extended Warranty for Batteries: Manufacturer warrants that batteries perform in accordance with specified requirements and agrees to provide repair or replacement of batteries that fail to perform as specified within extended-warranty period.

1. Initial Extended-Warranty Period for Li-ion Batteries: Three years from date of Substantial Completion; full coverage for materials only, free on board destination, freight prepaid.
2. Follow-On Extended-Warranty Period for Li-ion Batteries: 10 years from date of Substantial Completion; prorated coverage for materials only, free on board destination, freight prepaid.
3. Initial Extended-Warranty Period for Ni-Cd Batteries: Five years from date of Substantial Completion; full coverage for materials only, free on board destination, freight prepaid.

4. Follow-On Extended-Warranty Period for Ni-Cd Batteries: 15 years from date of Substantial Completion; prorated coverage for materials only, free on board destination, freight prepaid.

PART 2 - PRODUCTS

2.1 LUMINAIRES

A. 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.
- b. See individual product types below for listing criteria.
- c. Marked in accordance with UL CCN HYXT, including UL 1598, for compatible power supply, installation location, and environmental conditions.

B. Surface-Mounted Luminaire, Type N1 & N1E:

1. Product Description: 4 feet long strip light with optional emergency battery.
2. Product Characteristics:
 - a. Openings: Doors, frames, and access panels must operate smoothly, not leak light under operating conditions, and permit relamping without use of tools or parts falling from enclosure.
 - b. Nominal Operating Voltage: 120 V(ac).
 - c. Nominal Luminaire Operating Power Rating: 25 W.
 - d. CRI: 80+.
 - e. Ballast or Driver Location: Internal.
 - f. Battery for E-type: Factory-provided, 10 W.
 - g. Materials:
 - 1) Enclosure: Cold-rolled steel housing and heat sink; free of sharp edges and burrs.
 - 2) Enclosure Listing: Listed for use in damp locations.
 - 3) Lenses, Diffusers, and Globes:
 - a) Fixed lens.
 - b) Wide light distribution.
 - c) Snap-on frosted acrylic.
 - d) Lens Thickness: Not less than 0.125 inch unless otherwise indicated.
 - 4) Visible variations in metal finishes are unacceptable in adjoining components.

- h. LED Luminaires (UL CCN IFAM):
 - 1) Output Intensity: Not less than 3000 lm.
 - 2) Efficacy: Not less than 100 lm/W.
 - 3) Rated Life: 60,000 hours to L70.
 - 4) CCT: 3500 K.
- 3. Required Product Options:
 - a. Mounting Hardware: Ceiling-mounted or pendant-mounted.
 - b. Mounting Height: Not higher than 10 feet.
 - c. Finishes:
 - 1) Enclosure: White painted finish.
 - d. Visible variations in metal finishes are unacceptable in adjoining components.
- C. Surface-Mounted Luminaire, Type C1:
 - 1. Product Description: Continuous linear light.
 - 2. Product Characteristics:
 - a. Openings: Doors, frames, and access panels must operate smoothly, not leak light under operating conditions, and permit relamping without use of tools or parts falling from enclosure.
 - b. Nominal Operating Voltage: 120 V(ac).
 - c. Nominal Luminaire Operating Power Rating: 2.8 W per foot.
 - d. CRI: 90+.
 - e. Ballast or Driver Location: Remote.
 - f. Materials:
 - 1) Enclosure: Extruded-aluminum housing and heat sink; free of sharp edges and burrs.
 - 2) Enclosure Ingress Protection Rating: IP68.
 - 3) Lenses, Diffusers, and Globes:
 - a) Fixed lens.
 - b) Wide light distribution.
 - c) Frosted acrylic.
 - d) Lens Thickness: Not less than 0.125 inch unless otherwise indicated.
 - 4) Visible variations in metal finishes are unacceptable in adjoining components.
 - g. LED Luminaires (UL CCN IFAM):
 - 1) Output Intensity: Not less than 150 lm per foot.
 - 2) Efficacy: Not less than 55 lm/W.
 - 3) Rated Life: 50 000 hours to L70.
 - 4) CCT: 4000 K.

3. Required Product Options:

- a. Mounting Hardware: Adjustable hinged bracket.
- b. Mounting Height: As indicated on plans.
- c. Finishes:
 - 1) Enclosure: Silver anodized finish.
- d. Visible variations in metal finishes are unacceptable in adjoining components.

D. Surface-Mounted Luminaire, Type W1 & W1E:

- 1. Product Description: Custom-length curved-illuminated-surface linear-light with optional remote emergency battery pack.
- 2. Product Characteristics:
 - a. Openings: Doors, frames, and access panels must operate smoothly, not leak light under operating conditions, and permit relamping without use of tools or parts falling from enclosure.
 - b. Nominal Operating Voltage: 120 V(ac).
 - c. Nominal Luminaire Operating Power Rating: 3.5 to 7.5 W per foot.
 - d. CRI: 80+.
 - e. Ballast or Driver Location: Internal.
 - f. Battery for E-type: Factory-provided, remote.
 - g. Materials:
 - 1) Enclosure: Extruded-aluminum housing and heat sink; free of sharp edges and burrs.
 - 2) Enclosure listing: Listed for use in damp locations.
 - 3) Lenses, Diffusers, and Globes:
 - a) Fixed lens.
 - b) Wide light distribution.
 - c) Polycarbonate.
 - d) Lens Thickness: Not less than 0.125 inch unless otherwise indicated.
 - 4) Visible variations in metal finishes are unacceptable in adjoining components.
 - h. LED Luminaires (UL CCN IFAM):
 - 1) Output Intensity: Not less than 350 lm per foot.
 - 2) Efficacy: Not less than 99 lm/W.
 - 3) Rated Life: 50,000 hours to L85.
 - 4) CCT: 3500 K.
- 3. Required Product Options:
 - a. Mounting Hardware: Wall-mounted.
 - b. Mounting Height: Mount just below ceiling.

- c. Finishes:
 - 1) Enclosure: Clear anodized finish.
 - d. Visible variations in metal finishes are unacceptable in adjoining components.
- E. Recessed Luminaire, Type D1 & D1E:
- 1. Product Description: Round shower-rated downlight with optional emergency battery.
 - 2. Product Characteristics:
 - a. Ceiling Compatibility: NEMA LE 4.
 - b. Openings: Doors, frames, and access panels must operate smoothly, not leak light under operating conditions, and permit relamping without use of tools or parts falling from enclosure.
 - c. Nominal Operating Voltage: 120 V(ac).
 - d. Nominal Luminaire Operating Power Rating: 9 W.
 - e. CRI: 80+.
 - f. Ballast or Driver Location: Internal.
 - g. Battery for E-type: Factory-provided, 10W.
 - h. Materials:
 - 1) Enclosure: Galvanized-steel housing and heat sink; free of sharp edges and burrs.
 - 2) Enclosure Ingress Protection Rating: IP66.
 - 3) Lenses, Diffusers, and Globes:
 - a) Flush fixed lens.
 - b) Medium light distribution.
 - c) Lens Thickness: Not less than 0.125 inch unless otherwise indicated.
 - 4) Visible variations in metal finishes are unacceptable in adjoining components.
 - i. LED Luminaires (UL CCN IFAO):
 - 1) Output Intensity: Not less than 1000 lm.
 - 2) Efficacy: Not less than 90 lm/W.
 - 3) Rated Life: 60,000 hours to L70.
 - 4) CCT: 3500 K.
 - 3. Required Product Options:
 - a. Mounting Hardware: Recessed ceiling-mounted; include universal mounting bracket and integral junction box with conduit fittings.
 - b. Finishes:
 - 1) Enclosure: Painted finish.
 - 2) Reflector: Aluminum.
 - 3) Visible variations in metal finishes are unacceptable in adjoining components.

2.2 LUMINAIRE FITTINGS

A. 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.
- b. See individual product types below for listing criteria.

B. Luminaire Support Accessories:

1. Product Characteristics:

- a. Sized and rated for luminaire weight.
- b. Capable of maintaining luminaire position after cleaning and relamping.
- c. Capable of supporting luminaire without causing deflection of ceiling or wall.
- d. Capable of supporting horizontal force equal to 100 percent of luminaire weight and vertical force equal to 400 percent of luminaire weight.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of 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.

3.2 PREPARATION

A. Shop Drawings: Prepare and submit the following:

1. Drawings, Diagrams, and Supporting Documents for Custom Luminaires:

- a. Include plans, elevations, sections, and mounting and attachment details.
- b. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
- c. Include diagrams for power, signal, and control wiring.

3.3 INSTALLATION OF LIGHTING

- 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. Installation of Indoor Lighting Systems: NECA NEIS 500.
 2. Installation of Exterior Lighting Systems: NECA NEIS 501.
 3. Installation of Luminaires, Lampholders, and Lamps: Article 410 of NFPA 70.
 4. Installation of Emergency Lighting and Exit Signs: ICC IBC, NFPA 101, and Parts IV and V in Article 700 of NFPA 70.
 5. Consult Architect for resolution of conflicting requirements.
- C. Special Installation Techniques:
1. Install luminaires level, plumb, and square with finished floor or grade unless otherwise indicated.
 2. Install luminaires at height and aiming angle as indicated on Drawings.
 3. Coordinate layout and installation of luminaires with other construction.
 4. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.
 5. Flush-Mounted Luminaire Support:
 - a. Secured to outlet box.
 - b. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
 - c. Trim ring flush with finished surface.
 6. Wall-Mounted Luminaire Support:
 - a. Attached to structural members in walls or to a minimum 1/8 inch backing plate attached to wall structural members.
 - b. Do not attach luminaires directly to gypsum board.
 7. Suspended Luminaire Support:
 - a. Pendants and Rods: Where longer than 48 inch, brace to limit swinging.
 8. Emergency Power Units: Secure with approved fasteners in four or more locations, spaced near corners of unit.
 9. Install wiring connections for luminaires.
 10. Identification: Provide labels for luminaires and associated electrical equipment.
 - a. Identify field-installed conductors, interconnecting wiring, and components.
 - b. Provide warning signs.
 - c. Label each enclosure with laminated-plastic nameplate.
- D. Systems Integration: Integrate lighting control devices and equipment with electrical power connections for operation of luminaires as specified.

3.4 FIELD QUALITY CONTROL OF LIGHTNG

A. Tests and Inspections:

1. Perform manufacturer's recommended tests and inspections.
2. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
3. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
4. Verify operation of photoelectric controls.
5. Exterior Illumination Tests:
 - a. Measure light intensities at night. Use photometers with calibration referenced to NIST standards.

B. Nonconforming Work:

1. Luminaire will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective units and retest.

C. Field Quality-Control Reports: Collect, assemble, and submit test and inspection reports.

3.5 PROTECTION

- A. After installation, protect lighting 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 265000

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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. The WORK under this Section includes providing all labor, materials, tools, mobilization and demobilization and equipment necessary for clearing, grubbing, removing and disposing of all vegetation and debris (including earthen materials incidentally removed with vegetation and debris), within the limits shown on the Site Demolition Drawings or designated by the ENGINEER, except such objects as are designated to remain in place or are to be removed in accordance with other sections of these Specifications. The WORK shall also include the preservation from injury or defacement of all vegetation and objects designated to remain.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 GENERAL

- A. The CONTRACTOR will establish the limits of the WORK and shall protect and preserve all items designated to remain.
- B. All vegetation and debris to be removed shall be disposed of by the CONTRACTOR on a approved disposal sites. No open burning shall be allowed on the Project site. MOS will allow vegetation and woody debris disposal on the MOS 15 Acre site as directed and approved by the MOS Public Works Director. MOS will charge the CONTRACTOR for disposing of waste materials at the MOS 15 Acre site.
- C. If the CONTRACTOR elects to use a different disposal site the CONTRACTOR will be responsible for:
 - 1. Securing waste disposal sites
 - 2. Obtaining written permission of the owner of the disposal site and
 - 3. Securing any required permits, if none is indicated on the Drawings.

The cost of securing such sites shall be borne by the CONTRACTOR. If requested by the ENGINEER, the CONTRACTOR shall furnish the permit numbers of all required permits for disposal sites.

3.2 GRUBBING

- A. All trees, stumps, roots and other objects not designated to remain shall be cleared, grubbed and removed.

- B. In areas outside of the grading limits of cut and embankment areas and to the established limits of the WORK, all stumps and nonperishable solid objects permitted to remain in place shall be cut off not more than six inches above the ground line or low water level.
- C. Except in areas to be excavated, stump holes and other holes from which obstructions are removed shall be backfilled with suitable materials and compacted in accordance with the Contract Documents.

END OF SECTION 311000

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. The WORK under this Section includes providing all labor, materials, tools and mobilization and demobilization for any equipment necessary to maintain temporary erosion control devices; including, but not limited to, straw wattles, silt fences, straw bales, rock check dams, etc.
- B. The WORK includes the CONTRACTOR submitting an Erosion and Sediment Control Plan.
- C. The WORK also includes sweeping, watering, and vacuuming Congress Way and the east west access road between Broadway Street and Congress Way.
- D. The area of disturbance is less than 1 acre.

1.3 DEFINITIONS

- A. Erosion and Sediment Control Plan (ESCP). Permanent and temporary prevention of erosion and control of sedimentation during construction of the Project is included in the project Plans and Specifications.
- B. Best Management Practices (BMP's). A wide range of project management practices, schedules of activities or prohibition of practices that when used singly or in combination, prevent or reduce erosion, sedimentation and pollution of adjacent water bodies and wetlands. BMP's include both structural devices and non-structural practices and can be temporary or permanent. The State of Alaska DOT/PF Best management Practices for Construction Erosion and Sediment Control describes a variety of standard BMP's.

PART 2 – PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

- A. Do not begin earth disturbing work until temporary BMP's are in place.
- B. Contain, clean up, and dispose of all construction related (including office facilities) discharges of petroleum products and/or other materials hazardous to the land, air, water and organic life forms. Perform all fueling operations in a safe and environmentally responsible manner. Comply with the requirements of 18 AAC 75 and AS 46, Oil and Hazardous Substances Pollution Control.
- C. Implement all temporary and permanent erosion and sediment control measures identified in the Contract Documents.

- D. Perform other inspection, if directed, during or following high intensity rainfall events of any depth.
- E. The Contractor shall maintain existing temporary erosion control structures as necessary and/or as directed by the OWNER or ENGINEER for the duration of the contract. They shall be maintained in effective operating conditions at all times. Rock check dams, straw hay bale check dams and silt fences shall be cleaned whenever they have become half-filled with silt or debris, and other items shall be cleaned, repaired, or replaced as necessary.
- F. Temporary erosion control structures shall remain in place until the OWNER approves their removal.

END OF SECTION 311900

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. The WORK under this Section includes providing all labor, materials, tools, mobilization and demobilization and equipment necessary for common excavation and structural fill construction to the lines, grades and cross sections indicated in the Drawings, or as directed by the ENGINEER.

1.3 SUBMITTALS

- A. Current construction season gradation report for 3-inch minus structural fill material.

PART 2 – PRODUCTS

2.1 COMMON EXCAVATION

- A. Common excavation shall be silt, organics, muck, sand, gravel, cobbles, boulders and other granular material other than rock, and shall consist of excavation and disposal of these materials when encountered in the WORK.

2.2 USABLE EXCAVATION

- A. Usable material from excavation shall be sand, gravel, rock or combination thereof containing no muck, peat, frozen materials, roots, sod or other deleterious material. The ENGINEER shall determine if the excavated material meets the requirements of useable excavation.

2.3 STRUCTURAL FILL

- A. Structural Fill shall consist of non-frost-susceptible earth, sand, gravel, fractured rock or combination thereof containing no muck, peat, frozen materials, roots, wood, sticks, sod, organics or other deleterious materials, and shall be compactible to the density requirements specified in the Contract Documents. It shall also have a plasticity index not greater than 6 as determined by AASHTO T 90 and shall contain no more than 6% by weight of material passing the 200 mesh sieve. The percentage of material passing the 200 mesh sieve shall be determined using only the material which passes a 3 inch sieve.
- B. Structural Fill shall conform to the following gradation:

SIEVE DESIGNATION	PERCENT PASSING BY WEIGHT
3 Inch	100
1 Inch	60-80

No. 4	10 - 30
No. 200*	0 - 6

**Gradation shall be determined on that portion passing the 3-inch screen*

- C. Elongation Specification
 - i. The length of the crushed stone backfill shall not be more than twice the designated screed diameters.
- D. Sodium Sulfate Loss
 - i. Aggregate shall pass the percent sodium sulfate loss per AASHTO T 104 with 9% maximum.
- E. Structural Fill for this Project shall have a maximum L.A. Abrasion percent of wear of 45 per AASHTO T 96 test method.

PART 3 – EXECUTION

3.1 EXCAVATION

- A. Excavations shall be reasonably smooth and uniform to the lines, grades and cross sections shown in the Drawings or as directed by the ENGINEER. Excavations shall be conducted to ensure that material outside of excavation limits remains undisturbed.
- B. Excavations, within the restroom building footprint shall be maintained to drain freely at all times.
- C. When excavation to the limits indicated on the Drawings encounters unsuitable underlying material, the ENGINEER may require the CONTRACTOR to remove the unsuitable material and backfill with approved material. The CONTRACTOR shall take the necessary cross section measurements before backfill is placed in order to measure the amount of unsuitable material removed.
- D. Excavated soils that do not meet the requirements for usable excavation shall be disposed of by the CONTRACTOR at a location within the MOS 15-Acre site as directed by the MOS Public Works Director. No material may be wasted without the prior approval of the ENGINEER.
- E. The CONTRACTOR is responsible for securing additional waste disposal sites other than the MOS 15-Acre disposal site shown on the Drawings. The CONTRACTOR shall obtain the written permission of the landowner for use of all disposal sites, and shall either obtain any required permits or assure that they have been obtained by others. If required by the ENGINEER, the CONTRACTOR shall furnish the permit numbers of all required permits for the disposal sites. The costs of securing such sites shall be borne by the CONTRACTOR.
- F. Temporary storage on site of excavated materials that may be used on the Project is the responsibility of the CONTRACTOR.
- G. The CONTRACTOR shall conduct all operations to prevent contaminating useable excavation with unsuitable material.

- H. The CONTRACTOR shall provide added care when excavating adjacent to existing roadways and existing underground utilities. Damage caused to existing roadways and utilities by the CONTRACTOR shall be repaired at the CONTRACTOR's expense.
- I. After excavation to the subcut limit is complete and prior to backfilling with structural fill, the bottom of the subcut in building excavation areas shall be proof rolled with an excavator or self propelled compactor until a firm base for the structural fill material is obtained.

3.2 STRUCTURAL FILL

- A. Structural fill shall be constructed to a reasonably smooth and uniform shape conforming to the lines, grades and cross sections indicated on the Drawings or as directed by the ENGINEER.
- B. Structural fill construction includes, but is not limited to, placing and compacting structural fill below and adjacent to building foundation walls and footings, and concrete slabs. Only approved materials shall be used in the construction of structural fills.
- C. Structural fill shall not be placed on frozen ground.
- D. Red top grading hubs shall be set to top of structural fill within the building footprint for this project where structural fill has been placed and compacted to ensure proper elevations have been obtained. They shall be set by the CONTRACTOR at breaks in the grade and on even grade intervals not to exceed 25 feet intervals.
- E. When structural fill is to be placed on both sides of a concrete wall or box-type structure, operations shall be so conducted that the structural fill is always at approximately the same elevation on both sides of the structure.
- F. The finish subgrade surface (bottom of base course) shall not vary more than 0.05-foot when tested using a ten foot straightedge.
- G. If continued hauling over a completed or partially completed structural fill area causes loss of stability as evidenced by pumping or rutting, or other damage, the CONTRACTOR shall repair the damaged structural fill at its own expense and adjust its hauling equipment and procedures so as to avoid further damage.

3.3 STRUCTURAL FILL CONSTRUCTED WITH MOISTURE DENSITY CONTROL

- A. Except for embankments constructed predominantly of rock fragments or boulders, all embankments shall be constructed with moisture density control. Embankments shall be placed in horizontal layers not to exceed 12 inches in depth, loose measurement, for the full width of the embankment, except as required for traffic, and shall be compacted before the next layer is placed. A smaller depth will be required if the compaction equipment is considered by the ENGINEER to be insufficient to obtain the required densities. Embankments shall be compacted at the approximate optimum moisture content to not less than 95% of the maximum density as determined by AASHTO T 180 D or Alaska T-12. Embankment materials may require drying or moistening to bring the

moisture content near to optimum. In-place field densities will be determined by Alaska T-3 or T-11. Sufficient time shall be allowed between placement of layers to allow for field density tests.

END OF SECTION 312001

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. The WORK under this Section includes providing all labor, materials, tools, mobilization and demobilization and equipment necessary for the excavation and backfill required for installation of underground utility pipes, and other appurtenances as shown on the Drawings or as directed by the ENGINEER.

PART 2 - MATERIALS

2.1 TRENCH EXCAVATION

- A. Trench excavation shall consist of all material, of whatever nature, excepting liquids, excavated from trenches for underground pipe, conduit or structure installation.

2.2 BEDDING

- A. Pipe bedding for all underground utilities to be installed under this CONTRACT shall be base course grading D-1 as defined in Section 312003.

2.3 BACKFILL

- A. Backfill is defined as material placed above the level of bedding material. Backfill material consists of native material excavated from the trench that is determined by the ENGINEER to be suitable as backfill. Backfill material used under concrete pavement, as shown on the Drawings, shall be non-frost-susceptible, granular material that is free of rocks larger than six inches, much, frozen material, lumps, organic material, trash, lumber, or other debris. All backfill material available from trench excavation shall be utilized prior to the use of the imported backfill.

2.4 IMPORTED BACKFILL

- A. Imported backfill shall be granular material, free draining, free of much, frozen material, lumps, or organic material and shall conform to the following gradation:

Sieve Designation	Percent Passing by Weight
3 Inch	100
No. 4 *	20-70
No. 200 *	0-6

*Gradation shall be determined on that portion passing the three inch screen.

2.5 AGGREGATE BASE

- A. Aggregate base shall conform to Grading D-1 of Section 312003 - Base Course.

2.6 PORTLAND CEMENT CONCRETE

- A. Portland cement concrete shall conform to that specified in Section 321313 - Site Concrete.

PART 3 - EXECUTION

3.1 EXCAVATION

- A. Excavation for trenches shall conform to the lines and grades shown on the Drawings and to the limits depicted in the Drawings. The CONTRACTOR shall also do any WORK necessary to prevent surface water from entering the trench including dewatering of the trench to maintain dry pipe laying conditions.
- B. Excavation of any and all material more than six inches below the invert of the pipe as shown on the Drawings shall be done only when ordered in writing by the ENGINEER. The material so excavated will be handled in the manner described below:
1. All excavated material suitable for use as backfill shall be piled in an orderly manner separately from unsuitable material, at a sufficient distance from the edge of the trench to prevent material from sloughing or sliding back into the trench. When the trench is in a traveled roadway the ENGINEER may require removal and temporary storage of excavated material elsewhere.
 2. Materials unsuitable for use as backfill shall be hauled to a CONTRACTOR furnished disposal site off of the Project, unless otherwise directed in writing by the ENGINEER. The CONTRACTOR is responsible for securing waste disposal sites if none is indicated on the Drawings. The CONTRACTOR shall obtain the written permission of the landowner for use of all disposal sites, and shall either obtain any required permits or assure that they have been obtained by others. If requested by the ENGINEER, the CONTRACTOR shall furnish the permit numbers of all required permits for the disposal sites. The cost of securing such sites shall be borne by the CONTRACTOR.
 3. If the CONTRACTOR fails to comply with the provisions of any state statute, city ordinance or permit pertaining to waste disposal or disposal sites, the ENGINEER shall have the right, after giving 30 days written notice, to bring the disposal sites into compliance and collect the cost of the WORK from the CONTRACTOR, either directly or by withholding monies otherwise due under the Contract.
- C. No more than 150 feet of trench shall be open in advance of laying the pipe, and no more than ten feet of trench shall remain open at the end of each working period. When the trench is in a traveled roadway, it shall be completely backfilled, in accordance with the Specifications, and the roadway opened to traffic at the end of each working period.

- D. Where required to prevent caving of the trench, or by any safety law or regulation such as OSHA, the CONTRACTOR shall furnish and install bracing and/or sheeting to protect the excavation. This bracing and/or sheeting shall be removed as trench backfill progresses.
- E. The CONTRACTOR shall provide temporary support of existing structures, as necessary, to protect the structures from settlement or other disturbances caused by construction activities. All structures disturbed by the CONTRACTOR's activities shall be returned to original condition, or better.

3.2 BEDDING

- A. Bedding shall be placed in conformance with the lines and grades shown on the Drawings. Before placing any bedding material, the bottom of the trench shall be hand raked ahead of the pipe laying operation to remove stones and lumps which will interfere with smooth and complete bedding of the pipe. The specified bedding material shall then be placed in layers the full width of the trench, each layer not exceeding eight inches in thickness loose measure, and compacted to 95% of maximum density as determined by AASHTO T 180 D, until the elevation of the plan grade for the pipe invert is attained. The pipe bed shall then be fine-graded by hand and compacted as above. Bell holes shall be hand dug at the location of joints and shall be of sufficient size to allow proper making of the joint and to prevent the collar or bell of the pipe from bearing on the bottom of the trench.
- B. After the pipe has been laid and approved for covering, the specified bedding material shall be placed evenly on both sides of the pipe for the full width of the trench. Approval for covering does not imply final acceptance of the pipe, or relieve the CONTRACTOR in any way of responsibility to complete the Project in conformance with the Drawings and Specifications. Bedding material shall be placed in layers. The thickness, loose measure, or the first layer shall be either one-half the outside diameter of the pipe plus two inches or eight inches, whichever is least. This layer shall be compacted as specified above to provide solid support to the underside of the pipe.
- C. The bedding material shall be placed and compacted in layers not more than eight inches in thickness, loose measure, up to a plane 12 inches above the top of the pipe.
- D. The initial density test at any location will be paid for by the OWNER. If the initial test shows that the material compaction is not as specified, the CONTRACTOR shall modify the compaction methods used, as approved by the ENGINEER, and have the material re-tested until the tests show that the compaction method meets with the Specification requirements. If the CONTRACTOR's compaction methods are not consistent and/or do not meet the requirements of these Specifications, the OWNER reserves the right to undertake additional compaction tests as necessary to determine the extent of substandard compaction, and to charge the CONTRACTOR for all such tests.

3.3 BACKFILL

- A. The trench shall be backfilled above the bedding material, as shown in the Drawings, with approved material saved from trench excavation. If there is not sufficient approved

material from the excavation, the backfilling of the trench shall be completed utilizing imported backfill. The backfill and/or imported backfill shall be compacted to 95% of optimum density within the sidewalk limits, as shown on the Drawings, and 90% elsewhere, as determined by AASHTO T 180 D. Lifts shall not exceed 12 inches in depth for loose material. After backfilling of the trench is completed, any excess material from trench excavation shall be hauled to a CONTRACTOR furnished disposal site off of the Project.

- B. At least 24 hours prior to commencing backfilling operations, the CONTRACTOR shall notify the ENGINEER of the proposed method of compaction. No method will be approved until the CONTRACTOR has demonstrated, under actual field conditions, that such method will produce the degree of compaction required.
- C. The initial density test at any location will be paid for by the OWNER. If the initial test shows that the material compaction is not as specified, the CONTRACTOR shall modify the compaction methods used, as approved by the ENGINEER, and have the material re-tested until the tests show that the compaction meets the Specification requirements. If the CONTRACTOR's compaction methods are not consistent and/or do not meet the requirements of these Specifications, the OWNER reserves the right to undertake additional compaction tests as necessary to determine the extent of substandard compaction, and to charge the CONTRACTOR for all such tests.

3.4 AGGREGATE BASE

- A. Aggregate base shall be placed in layers not exceeding six inches compacted depth, extending the full width of the trench and compacted to 95% of maximum density as determined by AASHTO T 180 D. The thickness of the top layer shall be such that, after compaction, the surface shall be at the elevation shown in the Drawings. Care shall be taken to ensure proper compaction near the sides of the trench, and to avoid segregation.

3.5 PORTLAND CEMENT CONCRETE

- A. Portland cement concrete shall be replaced in accordance with Section 321313 - Site Concrete, and the details shown on the Drawings.

END OF SECTION 312002

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. The WORK under this Section includes providing all labor, materials, tools and equipment and mobilization and demobilization for any equipment necessary for furnishing and placing one or more layers of aggregate base course on a prepared surface to the lines and grades shown on the Drawings, or as directed by the ENGINEER.

1.3 SUBMITTALS

- A. Current construction season Base Course Grading D-1 gradation report and modified laboratory proctor.

PART 2 - PRODUCTS

2.1 BASE COURSE MATERIAL

- A. Aggregate base course shall consist of crushed gravel or crushed stone, conforming to the quality requirements of AASHTO M 147. The aggregate shall be free from lumps, balls of clay, or other unusable or contaminating matter, and shall be durable and sound.
- B. The base course shall be sampled according to “WAQTC FOP for AASHTO T2-Sampling Aggregates” as described in the *Alaska Test Methods Manual*, published by the Alaska Department of Transportation and Public Facilities.
- C. Coarse aggregate (that material retained on a No. 4 sieve) shall be crushed stone and shall consist of sound, tough, durable rock of uniform quality. Rock shall be free of schist that cleaves along preferred foliation planes. Rock shall be free of platy mineral grains. Metamorphosed rock shall be free of slaty cleavage. All material shall be free of from clay balls, vegetable matter or deleterious matters. Coarse aggregate shall not be coated with dirt or other finely divided matter. All aggregates shall be free of roots and wood. In addition, coarse aggregate shall meet the following requirements:
 - L.A. Wear, %, 25% maximum loss in accordance with AASHTO T 96.
 - Degradation Value, 45 minimum in accordance with ATM 313.
 - Sodium Sulfate Soundness Loss, %, 9 maximum in accordance with AASHTO T 104.
- D. Base course material shall conform to the following gradations:

BASE COURSE GRADING D-1 GRADATION
(Percent passing by weight)

Sieve Size	D-1
1"	100
3/4"	70-100
3/8"	50-80

No. 4	35-50
No. 8	20-35
No. 40	8-20
No. 200	0-6

- E. For grading D-1, at least 70% by weight of the particles retained on a No. 4 sieve shall have at least one fractured face as determined by Alaska T-4.
- F. Base course for this Project shall have a maximum Nordic Abrasion Value of 18, as determined by ATM 312, and shall meet the gradation requirements for grading D-1.

PART 3 - EXECUTION

3.1 GENERAL

- A. Prior to placement of the base course, the underlying surface shall be prepared by dressing, shaping, wetting or drying, and compacting of the underlying material to a minimum density of 95% as determined by AASHTO T 180-D. Surfaces shall be cleaned of all foreign substances and debris.
- B. Any ruts or soft yielding spots that may appear shall be corrected by loosening and removing unsatisfactory material and adding material approved in these Contract documents as required, reshaping, and recompacting the affected areas to the lines and grades indicated on the Drawings. If required by the ENGINEER the CONTRACTOR shall proof load questionable areas with a loaded truck or other piece of equipment approved by the ENGINEER.
- C. Blue-top grading hubs shall be set as required to the top of base course to control final base course grading elevations prior to placing concrete.
- D. Base course material shall be deposited and spread in a uniform layer to the required grades, and to such loose depth that when compacted to the density required, the thickness will be as indicated on the Drawings. Portions of the layer which become segregated shall be removed and replaced with a satisfactory mixture, or shall be remixed to the required gradation.
- E. The maximum compacted thickness of any one layer shall not exceed six inches, except the compacted depth of a single layer may be increased to eight inches if compaction equipment capable of delivering sufficient compactive energy, as determined by the ENGINEER is used. If the contract documents require the compacted depth to exceed six inches, the base shall be constructed in two or more layers of approximately equal thickness. Each layer shall be shaped and compacted before the succeeding layer is placed.
- F. The base course shall be compacted to at least 95% of maximum density as determined by AASHTO T 180-D. In places not accessible to rolling equipment, the mixture shall be compacted with hand-tamping equipment.

- G. Blading, rolling, and tamping shall continue until the surface is smooth and free from waves and irregularities. If at any time the mixture is excessively moistened, it shall be serrated by means of blade graders, harrows, or other approved equipment, until the moisture content is such that the surface can be recompacted and finished as above.

- H. The finished surface of the base course, when testing using a ten foot straightedge shall not show any deviation in excess of 3/8 inch between two contact points. The finish surface shall not vary more than 1/2 inch from established grade. Additionally, the algebraic average of all deviations from established grade of the finish base course surface elevations taken at 50-foot intervals shall be less than 0.02 foot.

- I. The initial density test at any location will be paid for by the OWNER. If the initial test shows that the material compaction is not as specified in the Contract documents and Drawings, the CONTRACTOR shall modify the compaction methods used, as approved by the ENGINEER, and have the material retested until the tests show that the compaction meets the Specification requirements. All tests, after the initial test at any given location, shall be paid for by the CONTRACTOR. The determination that the material compaction is not as specified in the Contract documents and Drawings shall be made by the ENGINEER and such decision is final. Compaction shall not be determined satisfactory or complete until approved by the ENGINEER.

END OF SECTION 312003

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 DUST ABATEMENT

- A. The CONTRACTOR shall furnish all labor, equipment, mobilization, demobilization and means required and shall carry out effective measures wherever and as often as necessary to prevent its operation from producing dust in amounts damaging to property, cultivated vegetation, or domestic animals, or causing a nuisance to persons living in or occupying buildings in the vicinity. The CONTRACTOR shall be responsible for any damage resulting from any dust originating from its operations. The dust abatement measures shall be continued until dust is no longer produced and the CONTRACTOR is relieved of further responsibility by the ENGINEER.

1.3 RUBBISH CONTROL

- A. During the progress of the WORK, the CONTRACTOR shall keep the site of the WORK and other areas used by it in a neat and clean condition, and free from any accumulation of rubbish. The CONTRACTOR shall dispose of all rubbish and waste materials of any nature occurring at the WORK site, and shall establish regular intervals of collection and disposal of such materials and waste. No burning is permitted on site. The CONTRACTOR shall also keep its haul roads free from dirt, rubbish, and unnecessary obstructions resulting from its operations. Disposal of all rubbish and surplus materials shall be off the site of construction in accordance with local codes and ordinances governing locations and methods of disposal, and in conformance with all applicable safety laws, and to the particular requirements of Part 1926 of the OSHA Safety and Health Standards for Construction.

1.4 SANITATION

- A. Toilet Facilities: Fixed or portable chemical toilets shall be provided wherever needed for the use of employees. Toilets at construction job sites shall conform to the requirements of Part 1926 of the OSHA Standards for Construction.
- B. Sanitary and Other Organic Wastes: The CONTRACTOR shall establish a regular daily collection of sanitary and organic wastes. All wastes and refuse from sanitary facilities provided by the CONTRACTOR or organic material wastes from any other source related to the CONTRACTOR's operations shall be disposed of away from the site in a manner satisfactory to the ENGINEER and in accordance with all laws and regulations pertaining thereto.

1.5 CHEMICALS

- A. All chemicals used during Project construction or furnished for Project operation, whether defoliant, soil sterilant, herbicide, pesticide, disinfectant, polymer, reactant or of other classification, shall show approval of either the U.S. Environmental Protection

Agency or the U.S. Department of Agriculture. Use of all such chemicals and disposal of residues shall be in strict accordance with the printed instructions of the manufacturer. In addition, see the requirements set forth in paragraph 6.11 of the General Conditions.

1.6 EAGLE NESTING TREES

- A. Eagle nesting trees are known to exist in the Skagway area, although none are known to exist in the immediate vicinity of the Project site. The CONTRACTOR has the responsibility for adherence to the Bald Eagle Protection Act (16 U.S.C. 668-668d) which prohibits molesting or disturbing bald eagles, their nests, eggs, or young.
- B. Guidelines for compliance to the Bald Eagle Protection Act are supervised by the U.S. Department of the Interior, Fish and Wildlife Service, Alaska Migratory Birds Office 1011 E. Tudor Rd., MS 201 Anchorage, Alaska 99503, phone (907) 209-9309. The contact person is Steve Lewis, Wildlife Biologist – Raptors. The CONTRACTOR shall contact the Raptor Biologist for guidelines of the Bald Eagle Protection Act.

PART 2 - PRODUCTS (Not Used)

PART 3- EXECUTION (Not Used)

END OF SECTION 312318

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. The CONTRACTOR shall furnish all labor, materials, tools, mobilization and demobilization and tools for site dewatering during excavation operations for the Project. Dewatering consists of lowering and controlling groundwater levels and hydrostatic pressures to permit site and building excavation and structural fill placement and compaction to be performed in near dry conditions. All equipment, materials and labor necessary shall be furnished by the CONTRACTOR to ensure dewatered conditions.

1.3 QUALITY CONTROL

- A. Maintain adequate supervision and control to ensure that stability of excavated and constructed slopes are not adversely affected by water, erosion is controlled, and flooding of excavation does not occur.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 DEWATERING

- A. Provide an adequate system to lower and control groundwater in order to permit excavation and placement of structural fill materials. Install sufficient dewatering equipment to drain water-bearing strata above and below bottom of storm drains, sewers, water mains and other excavations.
- B. Dispose of water removed from excavations in a manner to avoid endangering public health, property, and portions of WORK under construction or completed. Dispose of water in a manner to avoid inconvenience to others. Provide sumps, sedimentation tanks, and other flow control devices as required by governing authorities to maintain proper water quality.
- C. The CONTRACTOR shall submit a dewatering plan to the ENGINEER. Written approval of the CONTRACTOR's dewatering plan shall be obtained prior to commencement of WORK.
- D. The dewatering plan shall include, but should not be limited to the following provisions:
 - 1. Prevent surface or groundwater from flowing into or accumulating in excavations.
 - 2. Prevent water from flowing in an uncontrolled fashion across the project site or to erode slopes or to undermine cut slopes.
 - 3. Prevent water from being diverted onto adjacent properties.
 - 4. Provide continual and effective drainage of excavations.

5. Provide and maintain temporary diversion ditches, dikes, and grading as necessary. Trench excavations shall not be used for this purpose.
6. Provide sumps, wellpoints, french drains, pumps, and other control measures necessary to keep excavations free of water.
7. Provide control measures prior to excavation to water level and maintain water level continuously below working level.

END OF SECTION 312319

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. The WORK under this Section includes providing all labor, materials, tools, mobilization and demobilization and equipment necessary to perform all surveying and staking necessary for the completion of the Project in conformance with the Drawings and Specifications and standard surveying practices, including all calculations required to accomplish the WORK.
- B. The WORK shall include the staking, referencing and all other actions as may be required to preserve and restore land monuments and property corners which are situated within the Project area, and to establish monuments as shown on the Drawings.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 CONSTRUCTION

- A. All surveying involving property lines or monuments shall be done by, or under the direction of, a Registered Land Surveyor licensed in the State of Alaska.
- B. The ENGINEER will supply information relative to the approximate locations of monuments and corners, but final responsibility for locations, referencing, and restoration shall rest with the CONTRACTOR.
- C. In the event the CONTRACTOR does not replace the survey monuments and property corners disturbed by the CONTRACTOR's operations, the ENGINEER may, after first notifying the CONTRACTOR, replace the monuments in question. The cost of such replacements shall be deducted from payments to the CONTRACTOR.
- D. The CONTRACTOR shall provide the ENGINEER with a copy of all surveyors' notes, if requested by the ENGINEER, prior to each Pay Request payment.
- E. The CONTRACTOR shall provide the ENGINEER with a copy of all surveyors' notes, prior to the request for final payment, and include the information on the record drawings.
- F. The CONTRACTOR shall obtain all information necessary for as-built plan production, from actual measurements and observations made by its own personnel, including Subcontractors, and submit this information to the ENGINEER.

- G. The CONTRACTOR shall use competent, qualified personnel and suitable equipment for the layout work required and shall furnish all stakes, templates, straightedges and other devices necessary for establishing, checking and maintaining the required points, lines and grades.
- H. The CONTRACTOR shall perform all staking necessary to delineate clearing and/or grubbing limits; new building layout, including the necessary checking to establish the proper location and grade to best fit the conditions on site; the setting of such finishing stakes as may be required; the staking, referencing and other actions as may be required to preserve or restore land monuments and property corners; and all other staking necessary to complete the project.
- I. Field notes shall be kept in standard bound notebooks in a clear, orderly and neat manner, consistent with standard surveying practices. The CONTRACTOR's field books shall be available for inspection by the ENGINEER at any time.
- J. All field survey notes, shall be recorded by a notekeeper furnished by the CONTRACTOR. The notekeeper shall be thoroughly familiar with generally accepted standards of good survey notekeeping practice.
- K. The ENGINEER may randomly spot-check the CONTRACTOR's surveys, staking and computations at the ENGINEER discretion. After the survey or staking has been completed, the CONTRACTOR shall provide the ENGINEER with a minimum of 72 hours notice prior to performing any WORK, and shall furnish the appropriate data as required, to allow for such random spot-checking; however, the ENGINEER assumes no responsibility for the accuracy of the WORK.
- L. A closed level loop is required through Temporary Bench Marks (TBMs) listed in the Drawings. No side shots will be permitted. A copy of the surveyor's notes shall be provided to the ENGINEER.

END OF SECTION 316000

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. The WORK under this Section includes providing all labor, materials, tools, mobilization and demobilization and equipment necessary for furnishing and installing portland cement concrete for site concrete structures in conformance with the Drawings and Specifications.
- B. Reference Section 033000 Cast in Place Concrete and Section 311314 Concrete Structures.

PART 2 - PRODUCTS

2.1 PORTLAND CEMENT

- A. Portland cement shall conform to the requirements of AASHTO M 85.
- B. Unless otherwise permitted by the ENGINEER, the product from only one mill and one brand and type of portland cement shall be used on the Project.

2.2 FINE AGGREGATE

- A. Fine aggregate for portland cement concrete shall conform to the requirements of AASHTO M 6 with the following exceptions:

Delete section on deleterious substances and substitute the following:

The amount of deleterious substances shall not exceed the following limits:

- Friable particles percent by weight5 max.
- Coal and Lignite, percent by weight using a liquid of 1.95 specific gravity
(only material that is brownish-black shall be considered as coal or lignite) ...0.5 max.
- Material passing the No. 200 sieve, percent by weight.....3.0 max.

Delete paragraph 4.2 of AASHTO M 6.

2.3 COARSE AGGREGATE

- A. Coarse aggregate for portland cement concrete shall conform to the requirements of AASHTO M 80, class A, with the following exceptions:

Delete section on deleterious substances and substitute the following:

The amount of deleterious substances shall not exceed the following limits:

- Coal and Lignite, percent by weight (only material that is brownish-black or

black shall be considered coal or lignite).....1.0 max.
Material passing the No. 200 sieve.....1.0 max
Thin-elongated pieces, percent by weight. (Length greater than five (5)
times average thickness)15 max.
Sticks and roots, percent by weight0.10 max.
Friable Particles, percent by weight.....0.25 max.
Maximum loss from AASHTO T 96 shall be 50 percent.
Maximum loss from AASHTO T-104 shall be 12 percent.

2.4 JOINT FILLERS

A. Joint filler, of the type designated in the contract, shall conform to the following:

1. Poured filler shall conform to AASHTO M 173 or AASHTO M 282 as specified.
2. Preformed fillers shall conform to AASHTO M 33 for bituminous type; AASHTO M 153 for sponge rubber (type I), cork (type II), and self-expanding cork (type III); AASHTO M 213 for nonextruding and resilient bituminous types and resilient bituminous types and AASHTO M 220 for pre-formed elastomeric types as specified.
3. AASHTO M 220 for preformed elastomeric types as specified. The filler shall be punched to admit the dowels where called for on the Drawings. Joint filler shall be furnished in a single piece for the depth and width required for the joint unless otherwise authorized by the ENGINEER. When more than one piece is authorized for a joint, the abutting ends shall be fastened securely, and held accurately to shape, by stapling or other positive fastening satisfactory to the ENGINEER.
4. Foam filler shall be expanded polystyrene filler having a compressive strength of not less than 10 psi.
5. Hot -poured sealants for concrete and asphaltic pavements shall conform to ASTM D 3405.
6. Hot-poured elastomeric type sealant for concrete pavements shall conform to ASTM D 3406.
7. Cold-poured silicone type sealant for concrete pavements shall conform to Federal Specification TT-S-1543, Class A. The sealant shall be a one part, low-modulus silicone rubber with an ultimate elongation of 1,200 percent.

2.5 CURING MATERIAL

A. Curing material shall conform to the following requirements as specified:

1. Burlap Cloth made from Jute Kenaf AASHTO M 182.
2. Sheet Material for Curing Concrete AASHTO M 171.
3. Liquid Membrane-Forming Compounds AASHTO M 148 for Curing Concrete, Type I.

B. The requirements specified in AASHTO M 148 covering "Liquid Membrane-Forming Compounds for Curing Concrete" are modified by adding the following:

1. Liquid membrane-forming compounds utilizing linseed oil shall not be used.

2.6 AIR ENTRAINING AGENTS

- A. Air-entraining admixtures shall conform to the requirements of AASHTO M 154.

2.7 MIXING WATER

- A. Unless otherwise permitted in writing by the ENGINEER, all water shall be obtained from a potable water system.

2.8 REINFORCING STEEL

- A. Reinforcing shall conform to AASHTO M 31, and be of grade 60 or the grade designated on the Drawings or in the Specifications. Welded wire fabric shall conform to AASHTO M 55. Epoxy coated reinforcing bars shall conform to AASHTO M 284.

2.9 SHIPPING AND STORAGE OF CEMENT

- A. Cement may be shipped from pretested approved bins. The cement shall be well protected from rain and moisture. Any cement damaged by moisture or which fails to meet any of the specified requirements shall be rejected and removed from the WORK.
- B. Cement stored by the CONTRACTOR for a period longer than 60 days in other than sealed bins or silos shall be retested before being used. Cement of different brands, types, or from different mills shall be stored separately.

2.10 COMPOSITION OF CONCRETE

- A. All portland cement concrete shall be ready-mix, provided by an approved plant regularly engaged in the production of concrete, unless otherwise authorized in writing by the ENGINEER. Ready-mix concrete shall conform to the requirements of AASHTO M 157.
- B. The CONTRACTOR shall furnish the mix design to the ENGINEER for approval. The mix design shall be suitable for its intended use. Concrete shall be designed using an absolute volume analysis. The CONTRACTOR shall be responsible for having each mix design tested at a laboratory. Prior to the start of production of any mix design, the CONTRACTOR shall submit test results and certifications for all materials, detailed mix design data and results of laboratory tests to the ENGINEER for approval. Approval by the ENGINEER will be based on apparent conformity to these Specifications. It shall remain the CONTRACTOR's responsibility during production to produce concrete conforming to the mix design and the minimum acceptance criteria in the contract. When requested by the ENGINEER, the CONTRACTOR shall submit samples of all materials for verification testing. Production shall not commence until the mix design is approved by the ENGINEER.
- C. Unless otherwise specified the design mix for the site concrete shall meet the following:
 - Minimum cement content 6 1/2 sacks (611 lb.) per C.Y.
 - Maximum water/cement ratio 5.75 gal/sack (0.51 #/#)
 - 28-day compressive strength (fc) as indicated on Drawings.
 - Slump 3" ± 1"
 - Entrained Air 3 to 6%

Coarse Aggregate AASHTO M 43, Gradation No. 67
Cement factors are based on 94-pound sacks

- D. The CONTRACTOR shall be responsible for producing and placing specification concrete with a cement content within a tolerance of two percent.
- E. The use of superplasticizers in the concrete mix to improve the workability of mixes with low water cement ratios will require prior written approval by the ENGINEER.
- F. The CONTRACTOR may, subject to prior approval in writing, use alternative sizes of coarse aggregate as shown in Table 1 of AASHTO M 43. If the use of an alternative size of coarse aggregate produces concrete which exceeds the permissible water-cement ratio above, thereby requiring additional cement above that specified, no compensation will be made to the CONTRACTOR for the additional cement.

2.11 SAMPLING AND TESTING

- A. Field tests of all materials will be made by the ENGINEER when deemed necessary, in accordance with the applicable Specifications. When the results of the field tests indicate the material does not conform to the requirements of the Specifications, the re-tests required by the ENGINEER shall be at the CONTRACTOR's expense.
- B. Materials which fail to meet contract requirements, as indicated by laboratory tests, shall not be used in the WORK. The CONTRACTOR shall remove all defective materials from the site.
- C. Types and sizes of concrete specimens shall be in accordance with ASTM C 31. Additional slump tests and/or test cylinders may be required at the discretion of the ENGINEER. Should the analysis of any test cylinder not meet the preceding requirements of Article 2.10 (Composition of Concrete) its representative concrete shall be removed and replaced at the CONTRACTOR's expense.
- D. Three copies of all test reports shall be furnished to the ENGINEER.

2.12 COLD WEATHER CONCRETE

- A. Concrete shall not be placed when the descending air temperature in the shade, away from artificial heat, falls below 40°F. Placement of concrete shall not resume before the ascending air temperature reaches 35°F, without specific written authorization. When the air temperature falls below 40°F, or is, in the opinion of the ENGINEER, likely to do so within a 24 hour period after placing concrete, the CONTRACTOR shall have ready on the job materials and equipment required to heat mixing water and aggregate and to protect freshly placed concrete from freezing.
- B. Concrete placed at air temperatures below 40°F shall have a temperature not less than 50°F nor greater than 70°F when placed in the forms. These temperatures shall be obtained by heating the mixing water and/or aggregate. Mixing water shall not be heated to more than 160°F.
- C. Binned aggregates containing ice or in a frozen condition will not be permitted nor will aggregates which have been heated directly by gas or oil flame or heated on sheet metal

over an open fire. When aggregates are heated in bins, only steam-coil or water-coil heating will be permitted, except that other methods, when approved, may be used. If live steam is used to thaw frozen aggregate piles, drainage times comparable to those applicable for washed aggregates shall apply.

- D. When the temperature of either the water or aggregate exceeds 100°F, they shall be mixed together so that the temperature of the mix does not exceed 80°F at the time the cement is added.
- E. Any additives must have prior approval of the ENGINEER before being used.
- F. The use of calcium chloride is prohibited.
- G. When placing concrete in cold weather, the following precautions shall be taken in addition to the above requirements:
 - 1. Heat shall be applied to forms and reinforcing steel before placing concrete as required to remove all frost, ice, and snow from all surfaces which will be in contact with fresh concrete.
 - 2. When fresh concrete is to be placed in contact with hardened concrete, the surface of the previous pour shall be warmed to at least 35°F, thoroughly wet, and free water removed before fresh concrete is placed.
 - 3. When Type I or II cement is used, freshly placed concrete shall be maintained at a temperature of not less than 70°F for three days or not less than 50°F for five days. When Type III cement is used, freshly placed concrete shall be maintained at a temperature of not less than 70°F for two days or not less than 50°F for three days.
 - 4. The above requirements are not intended to apply during the normal summer construction season when air temperatures of 40°F or higher can reasonably be anticipated during the two-week period immediately following concrete placement, or until the concrete is no longer in danger from freezing.
- H. When temperatures below 20°F are not expected during the curing period and, in the opinion of the ENGINEER, no other adverse conditions, such as high winds, are expected, concrete temperatures may be maintained in thick concrete sections by retention of heat of hydration by means of adequately insulated forms.
- I. When, in the opinion of the ENGINEER, greater protection is required to maintain the specified temperature, the fresh concrete shall be completely enclosed and an adequate heat source provided. Such enclosure and heat source shall be so designed that evaporation of moisture from the concrete during curing is prevented. Precautions shall be taken to protect the structure from overheating and fire.
- J. At the end of the required curing period protection may be removed, but in such a manner that the drop in temperature of any portion of the concrete will be gradual and not exceed 30°F in the first 24 hours.
- K. For concrete placed within cofferdams and cured by flooding with water, the above conditions may be waived provided that the water in contact with the concrete is not permitted to freeze. De-watering shall not be carried out until the ENGINEER

determines that the concrete has cured sufficiently to withstand freezing temperatures and hydrostatic pressure.

- L. The CONTRACTOR shall be wholly responsible for the protection of the concrete during cold weather operations. Any concrete injured by frost action or overheating shall be removed and replaced at the CONTRACTOR's expense.

2.13 FORMS

- A. Forms shall be so designed and constructed that they may be removed without injuring the concrete.
- B. Unless otherwise specified, forms for exposed surfaces shall be made of plywood, hard-pressed fiberboard, sized and dressed tongue-and-groove lumber, or metal in which all bolt and rivet holes are countersunk, so that a plane, smooth surface of the desired contour is obtained. Rough lumber may be used for surfaces that will not be exposed in the finished structure. All lumber shall be free from knotholes, loose knots, cracks, splits, warps, or other defects affecting the strength or appearance of the finished structure. All forms shall be mortar tight, free of bulge and warp, and shall be cleaned thoroughly before reuse.
- C. In designing forms and falsework, concrete shall be regarded as a liquid. In computing vertical loads a weight of 150 pounds per cubic foot shall be assumed. The lateral pressure for design of wall forms shall not be less than that given by the following formulas:

For walls with R less than or equal to 7 feet per hour:

$$P=150 + \frac{9000R}{T}, \text{ but not more than } 2000 \text{ p.s.f. or } 150 \text{ h, whichever is less.}$$

For walls with R greater than 7 feet per hour:

$$P=150 + \frac{43,400}{T} + \frac{2800R}{T}, \text{ but not more than } 2000 \text{ p.s.f. or } 150 \text{ h, whichever is less.}$$

Where:

P = lateral pressure for design of wall forms, p.s.f.

R = rate of placement, feet per hour

T = temperature of concrete in forms, °F

h = maximum height of fresh concrete in form, feet.

- D. The above formulas apply to internally vibrated concrete placed at 10 feet per hour or less, without the use of retarding agents, and where depth of vibration is limited to four feet below the top of the concrete surface. The CONTRACTOR shall state the placement rate and minimum concrete temperature on the working drawings for concrete form WORK. Deflection of plywood, studs, and walers shall not exceed 1/360 of the span between supports.

- E. Forms shall be so designed that placement and finishing of the concrete will not impose loads on the structure resulting in adverse deflections or distortions.
- F. The forms shall be so designed that portions covering concrete that is required to be finished may be removed without disturbing other portions that are to be removed later. As far as practicable, form marks shall conform to the general lines of the structure.
- G. When possible, forms shall be day-lighted at intervals not greater than 10 feet vertically, the openings being sufficient to permit free access to the forms for the purpose of inspecting, and working.
- H. Metal ties or anchorages within the forms shall be so constructed as to permit their removal to a depth of at least one inch from the face without injury to the concrete. All fittings for metal ties shall be of such design that, upon their removal, the cavities which are left will be of the smallest possible size.
- I. All exposed edges 90° or sharper shall be chamfered 3/4 inch unless otherwise noted. Chamfering of forms for re-entrant angles shall be required only when specifically indicated on the Drawings.
- J. Forms shall be inspected immediately prior to the placing of concrete. Dimensions shall be checked carefully and any bulging or warping shall be remedied and all debris and standing water within the forms shall be removed. Special attention shall be paid to ties and bracing and where forms appear to be braced insufficiently or built unsatisfactorily, either before or during placing of the concrete, the ENGINEER shall order the WORK stopped until the defects have been corrected.
- K. Forms shall be constructed true to line and grade. Clean-out ports shall be provided at construction joints.
- L. All forms shall be installed in accordance with approved fabrication and erection plans.
- M. All porous forms shall be treated with non-staining form oil or saturated with water immediately before placing concrete.
- N. To facilitate finishing, forms used on exposed vertical surfaces shall be removed in not less than 12, nor more than 48 hours, depending upon weather conditions.

PART 3 - EXECUTION

3.1 GENERAL

- A. All concrete shall be placed before it has taken its initial set and, in any case, within 30 minutes after mixing. Concrete shall be placed in such a manner as to avoid segregation of coarse or fine portions of the mixture, and shall be spread in horizontal layers when practicable. Special care shall be exercised in the bottom of slabs and girders to assure the working of the concrete around nests of reinforcing steel, so as to eliminate rock pockets or air bubbles. Enough rods, spades, tampers and vibrators shall be provided to compact each batch before the succeeding one is dumped and to prevent the formation of joints between batches.

- B. Extra vibrating shall be done along all faces to obtain smooth surfaces. Care shall be taken to prevent mortar from splattering on forms and reinforcing steel and from drying ahead of the final covering with concrete.
- C. Concrete shall not be placed in slabs or other sections requiring finishing on the top surface when precipitation is occurring or when in the opinion of the ENGINEER precipitation is likely before completion of the finishing, unless the CONTRACTOR shall have ready on the job all materials and equipment necessary to protect the concrete and allow finishing operations to be completed.
- D. Troughs, pipes, or short chutes used as aids in placing concrete shall be arranged and used in such a manner that the ingredients of the concrete do not become separated. Where steep slopes are required, troughs and chutes shall be equipped with baffle boards or shall be in short lengths that reverse the direction of movement. All chutes, troughs, and pipe shall be kept clean and free of hardened concrete by flushing thoroughly with water after each run. Water used for flushing shall be discharged clear of the concrete in place. Troughs and chutes shall be of steel or plastic or shall be lined with steel or plastic and shall extend as nearly as possible to the point of deposit. The use of aluminum for pipes, chutes or tremies is prohibited. When discharge must be intermittent, a hopper or other device for regulating the discharge shall be provided.
- E. Dropping the concrete a distance of more than five (5) feet or depositing a large quantity at any point and running or working it along the forms will not be permitted. The placing of concrete shall be so regulated that the pressures caused by wet concrete shall not exceed those used in the design of the forms.
- F. High frequency internal vibrators of either the pneumatic, electrical, or hydraulic type shall be used for compacting concrete in all structures. The number of vibrators used shall be ample to consolidate the fresh concrete within 15 minutes of placing in the forms. In all cases, the CONTRACTOR shall provide at least two concrete vibrators for each individual placement operation (one may be a standby), which shall conform to the requirements of these Specifications. Prior to the placement of any concrete, the CONTRACTOR shall demonstrate that the two vibrators are in good working order and repair and ready for use.
- G. The vibrators shall be an approved type, with a minimum frequency of 5,000 cycles per minute and shall be capable of visibly affecting a properly designed mixture with a one inch slump for a distance of at least 18 inches from the vibrator.
- H. Vibrators shall not be held against forms or reinforcing steel nor shall they be used for flowing the concrete or spreading it into place. Vibrators shall be so manipulated as to produce concrete that is free of voids, is of proper texture on exposed faces, and of maximum consolidation. Vibrators shall not be held so long in one place as to result in segregation of concrete or formation of laitance on the surface.
- I. Concrete shall be placed continuously throughout each section of the structure or between indicated joints. If, in any emergency, it is necessary to stop placing concrete before a section is completed, bulkheads shall be placed as the ENGINEER may direct and the resulting joint shall be treated as a construction joint.

- J. The presence of areas of excessive honeycomb may be considered sufficient cause for rejection of a structure. Upon written notice that a given structure has been rejected, the rejected WORK shall be removed and rebuilt, in part or wholly as specified, at the CONTRACTOR's expense.

3.2 PUMPING CONCRETE

- A. Concrete may be placed by pumping if the CONTRACTOR demonstrates that the pumping equipment to be used will effectively handle the particular class of concrete with the slump and air content specified and that it is so arranged that no vibrations result that might damage freshly placed concrete. The operation of the pump shall be such that a continuous stream of concrete without air pockets is produced.
- B. When pumping is completed, the concrete remaining in the pipeline, if it is to be used, shall be ejected in such a manner that there will be no contamination of the concrete or separation of the ingredients. After this operation, the entire equipment shall be thoroughly cleaned. Slump tests shall be taken at the discharge end of the pipe.

3.3 EXPANSION JOINTS

- A. Expansion joints shall be located and formed as required on the Drawings.
- B. Open Joints. Open joints shall be placed in the location shown on the Drawings and shall be formed. The form shall be removed without chipping or breaking the corners of the concrete. Reinforcement shall not extend across an open joint, unless so specified on the Drawings.
- C. Filled Joints. Unless otherwise shown on the Drawings, expansion joints shall be constructed with pre-molded expansion joint filler with a thickness equal to the width of the joint.
- D. The joint filler shall be cut to the same shape and size as the adjoining surfaces. It shall be fixed firmly against the surface of the concrete already in place in such manner that it will not be displaced when concrete is deposited against it.
- E. Immediately after the forms are removed, the expansion joints shall be inspected carefully. Any concrete or mortar that has sealed across the joint shall be removed.
- F. Joint sealer for use in deck joints shall be of the type shown on the Drawings conforming to the requirements of Article 2.4 (Joint Filler) of this Section. The faces of all joints to be sealed shall be free of foreign matter, paint, curing compound, oils, greases, dirt, free water, and laitance.
- G. Elastomeric Compression Seals. The joint seal shall be shaped as shown on the Drawings. It shall be installed by suitable hand or machine tools and thoroughly secured in place with a lubricant-adhesive recommended by the seal manufacturer. The lubricant-adhesive shall cover both sides of the seal over the full area in contact with the sides of the joint.
- H. The seal shall be in one piece for the full width of the joint. Any joints at curbs shall be sealed adequately with additional adhesive.

- I. The seal may be installed immediately after the curing period of the concrete. Temperature limitations of the lubricant-adhesive as guaranteed by the manufacturer shall be observed.
- J. Strip Seals. Expansion joint strip seals shall be as shown on the Drawings, and composed of a steel extrusion and an extruded strip seal. The steel shall conform to ASTM A242 or A588. Strip seals shall be one piece for the length of the joint.
- K. Installation of the expansion joints shall be in accordance with the manufacturer's recommendations, except that the joint opening shall be adjusted for the dimensions indicated on the Drawings.

3.4 FINISHING CONCRETE SURFACES

- A. All concrete surfaces exposed in the completed WORK shall receive an Ordinary Finish, as described below, unless otherwise noted on the Drawings.

3.5 ORDINARY FINISH

- A. An Ordinary Finish is defined as the finish left on a surface after the removal of the forms, the filling of all holes left by form ties, and the repairing of all defects. The surface shall be true and even, free from stone pockets and depressions or projections. All surfaces that cannot be satisfactorily repaired shall be given a Rubbed Finish.
- B. The concrete in caps and tops of walls shall be struck off with a straightedge and floated to true grade. The use of mortar topping for concrete surfaces shall in no case be permitted.
- C. As soon as the forms are removed, metal devices that have been used for holding the forms in place, and which pass through the body of the concrete, shall be removed or cut back at least one inch beneath the surface of the concrete. Fins of mortar and all irregularities caused by form joints shall be removed.
- D. All small holes, depressions, and voids that show upon the removal of forms, shall be filled with cement mortar mixed in the same proportions as that used in the body of the WORK. In patching larger holes and honeycombs, all coarse or broken material shall be chipped away until a dense uniform surface of concrete exposing solid coarse aggregate is obtained. Feathered edges shall be cut away to form faces perpendicular to the surface. All surfaces of the cavity shall be saturated thoroughly with water, after which a thin layer of neat cement mortar shall be applied. The cavity shall then be filled with stiff mortar composed of one part portland cement to two parts sand, which shall be thoroughly tamped into place. The mortar shall be pre-shrunk by mixing it approximately 20 minutes before using. The length of time may be varied in accordance with brand of cement used, temperature, humidity, and other local conditions. The surface of this mortar shall be floated with a wooden float before initial set takes place and shall be neat in appearance. The patch shall be kept wet for a period of five days.
- E. For patching large or deep areas, coarse aggregate shall be added to the patching material. All mortar for patching on surfaces which will be exposed to view in the completed structure shall be color matched to the concrete. Test patches for color matching shall be

conducted on concrete that will be hidden from view in the completed WORK and shall be subject to approval.

3.6 CURING CONCRETE

A. Water Curing:

1. All concrete surfaces shall be kept wet for at least seven (7) days after placement if Type I or II cement has been used or for three days if Type III cement has been used. Concrete shall be covered with wet burlap, cotton mats, or other materials meeting the requirements of AASHTO M 171 immediately after final finishing of the surface. These materials shall remain in place for the full curing period or they may be removed when the concrete has hardened sufficiently to prevent marring. The surface shall immediately be covered with sand, earth, straw, or similar materials.
2. In either case the materials shall be kept thoroughly wet for the entire curing period. All other surfaces, if not protected by forms, shall be kept thoroughly wet, either by sprinkling or by the use of wet burlap, cotton mats, or other suitable fabric, until the end of the curing period. If wood forms are allowed to remain in place during the curing period, they shall be kept moist at all times to prevent opening at joints.

- #### B. Membrane Curing.
- Liquid membrane curing compound meeting the requirements of AASHTO M 148, Type I, may be permitted, subject to approval by the ENGINEER. Compounds utilizing linseed oil shall not be used. All finishing of concrete surfaces shall be performed to the satisfaction of the ENGINEER prior to applying the impervious membrane-curing compound. The concrete surfaces must be kept wet with water continuously until the membrane has been applied. The manufacturer's instructions shall be carefully followed in applying the membrane. In all cases, the membrane-curing compound must always be thoroughly mixed immediately before application. If the membrane becomes marred, worn, or in any way damaged, it must immediately be repaired by wetting the damaged area thoroughly and applying a new coat of the impervious membrane-curing compound. Membrane curing will not be permitted for concrete slabs that are to be covered with waterproof membranes, for polymer modified concrete or at construction joints.

3.7 BACKFILLING

- A. Unbalanced backfilling against concrete structures will not be permitted until the concrete has attained a compressive strength of not less than 80% of the ultimate strength (f'_c) shown on the Drawings.
- B. The compressive strength shall be determined from informational test cylinders cured on the site under similar conditions of temperature and moisture as the concrete in the structure.

3.8 CLEANING UP

- A. Upon completion of the structure and before final acceptance, the CONTRACTOR shall remove all form work, bracing, and stakes used to construct the concrete forms.

END OF SECTION 321313

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.
- B. Reference Section 033000 Cast in Place Concrete and Section 321313 Site Concrete.

1.2 SUMMARY

- A. The WORK under this Section includes providing all labor, materials, tools, mobilization and demobilization and equipment necessary for furnishing and installing concrete structures in accordance with these Specifications and in reasonably close conformity with the lines, grades, details, and locations shown on the Drawings or directed by the ENGINEER.
- B. The WORK under this Section also includes furnishing and installing steel bollards and concrete footings adjacent to the propane tank slab as shown on the Drawings.
- C. Civil Concrete Structures include but are not limited to concrete sidewalk around the building, sidewalk ramp and propane tank slab as shown on the Drawings.

1.3 SUBMITTALS

- A. Material Certificates: For each of the following, signed by manufacturer:
 - 1. Form-release agents.
 - 2. Joint filler for concrete sidewalk.
 - 3. Reinforcing steel shop drawings.
 - 4. Concrete mix design.
- B. Protection Bollard
 - 1. Bollard pipe

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Portland Cement shall conform to the requirements of AASHTO M 85.
- B. Aggregate shall be clean, durable, uniformly graded sand and gravel, or crushed stone, 100 percent passing a 1 1/2 inch sieve and containing not more than five percent passing a U.S. No. 200 sieve.
- C. Air-entraining admixtures shall conform to the requirement of AASHTO M 154.
- D. Water shall be obtained from a potable water system, unless otherwise permitted in writing by the ENGINEER.

- E. Curing materials shall conform to the requirements of AASHTO M 182, AASHTO M 171, or AASHTO M 148, as appropriate, except that AASHTO M 148 is modified to prohibit the use of compounds utilizing linseed oil.
- F. Reinforcing Steel shall conform to the requirements of AASHTO M 31.
- G. Joint Fillers shall be of the type specified in the contract, and shall conform to the appropriate following requirements:
 - 1. Poured filler shall conform to AASHTO M 173 or AASHTO M 282 as specified.
 - 2. Hot-poured sealants for concrete and asphaltic pavements shall conform to ASTM D 3405, color gray.
 - 3. Hot-poured elastomeric type sealant for concrete pavements shall conform to ASTM D 3406, color gray.
 - 4. Cold-poured silicone type sealant for concrete pavements shall conform to Federal Specification TT-S-1543, Class A. The sealant shall be one part, low-modulus silicone rubber with an ultimate elongation of 1,200 percent, color gray.
 - 5. Preformed fiber expansion joint fillers shall conform to AASHTO M 213 for non-extruding and resilient bituminous types.

2.2 COMPOSITION OF CONCRETE

- A. Portland cement concrete will ordinarily be accepted on the basis of certification.
- B. The concrete shall contain three to six percent of entrained air, as determined by AASHTO T 152. Concrete shall have a slump of not more than four inches as determined by AASHTO T 119.
- C. Concrete shall contain not less than 611 pounds of cement and not more than 300 pounds of water per cubic yard.
- D. The minimum 28 day compressive strength of site concrete shall be as specified in the Drawings.
- E. The concrete shall be subject to acceptance or rejection by visual inspection at the job site. Re-tempering concrete will not be permitted.
- F. The CONTRACTOR shall submit for approval the following:
 - 1. The type and sources of aggregates and cement.
 - 2. Scale weights of each aggregate proposed as pounds per cubic yard of concrete.
 - 3. Quantity of water proposed as pounds per cubic yard of concrete.
 - 4. Quantity of cement proposed as pounds per cubic yard of concrete.
 - 5. Air content.
 - 6. Slump.
- G. When a commercial supplier is used, the CONTRACTOR shall furnish a certification with each truckload of concrete certifying that the material and mix proportions used are in conformance with the approved mixture.

- H. Concrete complying with Section 321313 – Site Concrete will be acceptable as an approved mixture with appropriate certification.
- I. The ENGINEER may make and test cylinders for strength determinations.

2.3 FORMS

- A. Forms shall be designed and constructed to be removed without injuring the concrete. They shall be free of bulge and warp, and constructed so the finished concrete will be of the form and dimensions shown on the Drawings, and true to line and grade. Forms for concrete containing a retarding admixture shall be designed for a lateral pressure equal to that exerted by a fluid weighing 150 pounds per cubic foot.

2.4 BOLLARDS

- A. Bollard pipe shall be 6" diameter schedule 40, ASTM A53, factory galvanized steel pipe.
- B. Bollard top coat paint shall be a single component, polyurethane modified alkyd, gloss finish formulated for marine offshore conditions. Prime coat galvanized steel pipe after solvent cleaning the pipe surface following Society for Protective Coatings (SSPC) procedure SP-1. Solvent used for cleaning shall be compatible with the prime coat. Two (2) top coats. Color: MUTCD Yellow 116 or equivalent.

PART 3 - EXECUTION

3.1 PLACING CONCRETE

- A. Concrete shall be placed to avoid segregation of materials and shall be consolidated with mechanical vibrators in accordance with Section 321313 – Site Concrete.
- B. When concrete is placed by the pumping method or by tremie operations, the use of aluminum pipe or conduit for transporting the concrete will not be permitted.
- C. The intervals between delivery of batches for a single pour shall not exceed 30 minutes.
- D. When placing concrete at or below an atmospheric temperature of 35 °F the CONTRACTOR shall comply with the applicable requirements of Section 321313 – Site Concrete.

3.2 FINISHING CONCRETE SURFACES

- A. All concrete surfaces shall have an ordinary finish in accordance with the requirements of Section 321313 – Site Concrete, except "Concrete International Corporation" Ashford formula shall be used as a curing compound.

3.3 CURING CONCRETE

- A. All concrete will be cured a minimum of seven days, or, if high early strength cement is used, a minimum of three days. The concrete shall be cured in accordance with Section 321313 – Site Concrete.

3.4 AS-CAST FORMED FINISHES

- A. Rubbed Finish: Apply the following to smooth-form-finished as-cast concrete where indicated:
 - 1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

3.5 CONCRETE SLABS

- A. Concrete slabs shall conform to the details shown in the Drawings and to the grade lines on each side of the slabs as established and approved by the ENGINEER prior to placing concrete.

END OF SECTION 321314

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.
- B. Reference Section 321313 Site Concrete and Section 321214 Concrete Structures.

1.2 SUMMARY

- A. The WORK under this Section includes providing all labor, materials, tools, and equipment necessary for furnishing and installing concrete sidewalks around the building and the ramp as shown on the Drawings.

1.3 SUBMITTALS

- A. Construction Joint Layout Plan: Indicate proposed construction joints for all exterior concrete slabs as indicated in the Drawings and as required to be constructed on the Project.
 - 1. Location and layout of joints is subject to the approval of the ENGINEER.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Materials shall conform to the requirements of Section 321313 Site Concrete, except "Concrete International Corporation" Ashford Formula, or approved equal, shall be used instead of the specified curing materials.
- B. Joint fillers shall conform to requirements of Section 321313 – Site Concrete.

PART 3 - EXECUTION

3.1 METHODS OF CONSTRUCTION

- A. Concrete Sidewalks shall conform to the applicable requirements of Section 321313 – Site Concrete, and as shown on the Drawings, except "Concrete International Corporation" Ashford formula, or approved equal, shall be used as a curing compound.
 - 1. The curing compound shall be sprayed on the surface with a low-pressure sprayer immediately following the finishing operation.
 - 2. The entire surface shall be kept wet for 30 minutes by brooming excess material onto the dry spots or by re-spraying them immediately. No areas on the concrete surface shall be allowed to dry during the initial 30 minute period.
 - 3. As the curing compound begins to dry into the surface and becomes slippery, lightly sprinkle the surface with water to aid the penetration of the curing compound and to bring any alkali to the surface.

4. After 30 to 40 minutes, squeegee or broom the surface to remove any excess curing compound and alkali or other impurities brought to the surface. All WORK required for the application of the curing compound shall conform to the manufacturer's recommendations.

- B. All exposed or unprotected edges of sidewalks shall be tooled to a radius of not more than one-half inch. After floating, trowel finish the entire surface using steel trowels. Final finish shall be obtained by brooming the surface, including the tooled edge, to a gritty finish after all free moisture has disappeared from the surface. Sprinkling of cement or sand for blotting will not be permitted.

- C. Expansion joints shall be placed at a maximum of 30-foot intervals, along all structures and about all features that project into, through, or against the concrete.

- D. Expansion joint material shall conform to the requirements of AASHTO M 213. This material shall extend the full width of the structure and shall be cut to such dimensions that the base of the expansion joint shall extend to the subgrade and the top shall be depressed not less than one-quarter inch nor more than one-half inch below the finished surface of the concrete. The material shall be one piece in the vertical dimension and shall be securely fastened to the existing concrete face against which fresh concrete is to be poured.

- E. Joints shall be cleared of all gravel and loose material. Joint surfaces shall be kept clean and dry during sealing. Sealing shall be done in accordance to manufacturer's recommendations. Sealant placed incorrectly shall be removed and replaced at the CONTRACTOR's expense.

- F. Transverse contraction joints, cut to a depth of $\frac{1}{4}$ of the sidewalk thickness prior to the final set of the concrete. The joints shall be tooled in the slabs as shown on the Drawings.

- G. The CONTRACTOR shall protect all newly placed concrete from damage of any kind to prevent disfigurement during the curing period. Damaged concrete shall be repaired or replaced to the ENGINEER's satisfaction at no additional cost to the OWNER.

END OF SECTION 321315

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. The WORK under this Section includes providing all labor, materials, tools, mobilization and demobilization and equipment necessary for furnishing and installing buried HDPE water service supply pipe from the connection to the existing 2” HDPE service to the new mechanical chase. The CONTRACTOR shall install the water pipe and fittings to the horizontal and vertical alignment shown on the Drawings and shall complete all associated WORK described in this Section.

1.3 SUBMITTALS

- A. HDPE water pipe material certifications stating conformance with requirements of this section and that materials meet NSF 61 certification for public drinking water.

PART 2 – PRODUCTS

2.1 PIPE

- A. High Density Polyethylene Pipe (HDPE) and fittings are to be manufactured in accordance with AWWA C906 with the additional stipulation that the HDPE is to be manufactured from PE4710 polyethylene compounds that meet or exceed ASTM D3350 Cell Classification 445574. HDPE pipe and fitting material compound is to contain color and ultraviolet (UV) stabilizer meeting or exceeding the requirements of Code C per ASTM 03350. All fittings are to have pressure class ratings not less than the pressure class rating of the pipe to which they are joined.
- B. HDPE water service pipe shall be DR 11, 200 psi pressure rating.
- C. The individual who performs the joint fusion shall have written certification from an HDPE pipe manufacturer or supplier stating he/she has successfully completed a certification class on joint fusion techniques and procedures.
- D. All HDPE pipe shall be installed with a No. 10 AWG high-strength copper clad steel with a 30-mil HDPE insulation jacket (color blue) tracer wire and have a 600-pound average tensile break load. Tracer wire is to be manufactured by Copperhead Industries or an approved equal. The tracer will shall be continuous from the water well location to the mechanical room.
- E. All HDPE molded fittings and fabricated fittings shall be fully pressure rated to not less than the pipe SDR pressure rating specified. All fittings shall be molded or fabricated by the manufacturer. No Contractor fabricated fittings shall be used unless approved by the ENGINEER.

- F. All HDPE fittings shall be installed using butt-fused fittings, and must be approved by the ENGINEER.
- G. Electrofusion couplers are discouraged and may only be allowed only with prior, written approval of the Engineer.

2.2 UNDERGROUND MARKING TAPE

- A. Underground marking tape shall be blue, six inch wide, four mil thick, polyethylene tape with black lettering with the following wording: "Caution: Waterline Buried Below." Marking tape shall be installed 12 inches above the top of all water pipe.

PART 3 – EXECUTION

3.1 GENERAL

- A. The CONTRACTOR shall preserve and protect all existing utilities and other facilities including but not limited to: telephone, television, electrical, water and sewer utilities, surface or storm drainage, and survey monuments. The CONTRACTOR shall immediately repair or replace utilities or other facilities damaged during construction. The CONTRACTOR shall support and protect any underground utility conduits, pipes, or service lines where they cross the trench.

3.2 INSTALLATION

- A. Water pipe shall be installed in accordance with the manufacturer's printed specifications and instructions, and in conformance with AWWA C151.
- B. The water pipe shall be handled carefully to prevent damage to the pipe. Water pipe and fittings shall be loaded and unloaded using hoists and slings to avoid shock or damage, and under no circumstances shall they be dropped, skidded, or rolled. If any part of the HDPE pipe is damaged, repair thereof shall be made in a manner satisfactory to the ENGINEER at the CONTRACTOR's expense.
- C. All water pipe and fittings shall be inspected for defects. Damaged pipe will be rejected and the CONTRACTOR shall immediately place all damaged pipe apart from the undamaged and shall remove the damaged pipe from the site within 24 hours.
- D. Whenever it becomes necessary to cut a length of water pipe, the cut shall be made by abrasive saw or by special pipe cutter.
- E. All pipe ends shall be square with the longitudinal axis of the water pipe and shall be reamed and smoothed to ensure a good connection.
- F. The water supply pipe shall be laid to the horizontal and vertical alignment shown on the Drawings. Fittings shall be installed at the location shown on the Drawings.
- G. To prevent dirt and other foreign material from entering the pipe and fittings during handling and installation, the open end of the pipe shall be protected by a water-tight plug at all times except when joining the next section of pipe.

- H. Under no circumstances shall pipe deflections, either horizontal or vertical, exceed the manufacturer's printed recommendations. Where deflections would exceed the manufacturer's recommendations, fittings shall be used.
- I. HDPE pipe shall be joined in continuous lengths on the jobsite above ground. Final connections of the continuous lengths may be made in the trench. The joining method shall be the butt fusion method and shall be performed in strict accordance with the manufacturer's recommendations.
- J. The CONTRACTOR shall provide and submit to the ENGINEER for review and approval an HDPE fusion plan prior to beginning pipe fusion. The plan shall include:
 - 1. CONTRACTOR's fusion machine including make, model and year.
 - 2. Certification and documented experience for individual(s) performing the pipe fusion.
 - 3. Temperatures and pressures to be used for the HDPE pipe.
 - 4. Fusion machine manufacturer's procedures for pipe fusion.
 - 5. Fusion data logger or other approved method of Joint Data Recording - The critical parameters of each fusion joint, as required by the manufacturer and these specifications, shall be recorded either manually or by an electronic data logging device. All fusion joint data shall be included in the Fusion Technician's joint report.

3.3 FLUSHING

- A. Prior to acceptance, the CONTRACTOR shall flush the water pipe then perform hydrostatic tests. Flushing is required of all installed water pipes to remove any foreign matter. The CONTRACTOR shall furnish, install and remove all pumps, fittings and pipes necessary to perform the flushing; shall provide all additional excavation and backfill; and shall dispose of all water and debris flushed from the water pipe. A flushing scheme and schedule shall be submitted by the CONTRACTOR for review and approval by the ENGINEER prior to flushing.

3.4 HYDROSTATIC TESTING

- A. Defective materials or poor quality of WORK, discovered as a result of the hydrostatic tests, shall be replaced by the CONTRACTOR. Whenever it is necessary to replace defective material or correct the workmanship, the hydrostatic test shall be repeated until a satisfactory test is obtained.
- B. The ENGINEER shall be present for all hydrostatic and leakage tests. The CONTRACTOR shall notify the ENGINEER at least 24 hours prior to any test and shall notify the ENGINEER at least two hours in advance of the scheduled time if the test is to be cancelled or postponed.
- C. Newly installed water supply pipe is to be hydrostatically tested in two phases to whichever is greater: 150 PSI or 1.5 times the operating pressure. Acceptance pressure testing shall be done with the service line installed, corporation stops open, and pressure against the closed valves.

Phase I -Initial Expansion (4 hours) Pressurize the test section to the test pressure and maintain for four (4) hours. The contractor is to pump in additional test water into the pipe to maintain test pressure as the pipe expands slightly. It is not necessary to monitor the amount of water added during this phase.

Phase 2 - Pressure Testing (minimum 1 hour) Immediately following the initial expansion phase the Contractor is to stop adding testing fluid and then reduce pressure by 10 psi. The reduced pressure then becomes the test pressure and is to be held within five percent (5%) for one hour and show no visible leaks to be deemed as having passed the test. The maximum test duration is eight (8) hours. If the test is not completed in the maximum duration period, then the Contractor is to depressurize the test section completely and allow it to relax for at least eight (8) hours before pressurizing the test section again.

Correct ALL visible leaks, whether indicated during pressure testing or not.

3.5 DISINFECTION

- A. Disinfection by chlorination of all new water pipe shall be completed and a satisfactory bacteriological report obtained prior to placing the pipe in service. "Open-bore" flushing shall be completed before chlorination is begun.
- B. Chlorine shall be applied by one of the following methods:
 - 1. liquid chlorine gas-water mixture;
 - 2. direct chlorine gas feed; or
 - 3. hypochlorite commercial products such as HTH, Perchlolen, Macho-chlor, or approved equal.

The chlorinating agent shall be applied at the beginning of the section adjacent to the feeder connection, insuring treatment of the entire water pipe. Water shall be fed slowly into the new water pipe with chlorine applied in amounts to produce a dosage of 50 ppm. Application of the chlorine solution shall continue until the required residual of not less than 50 ppm free chlorine is evident at all extremities of the newly constructed line. The chlorinating agent shall be certified for disinfection of potable drinking water systems according NSF/ANSI 60 and satisfy the requirements of applicable ANSI/AWWA standards. Chlorinating agents for pools and/or spas are not allowed.

- C. The chlorine gas-water mixture shall be applied by means of a solution-feed chlorinating device. Chlorine gas shall be fed directly from a chlorine cylinder equipped with a suitable device for regulating the rate of flow and the effective diffusion of gas within the water pipe. Hypochlorite products shall be placed or injected into the water pipe. During the chlorination process, all intermediate valves and accessories shall be operated. Valves shall be manipulated so that the strong chlorine solution in the water pipe being treated will not flow back into the pipe supplying the water.
- D. A residual of not less than 50 ppm free chlorine shall be produced in all parts of the water pipe. After 24 hours detention there shall be a minimum free chlorine residual of 25 ppm in all parts of the water pipe. This residual shall then be neutralized in the pipe by

injecting an approved reducing agent such as sulfur dioxide, sodium bisulfate, sodium sulfite or sodium thiosulfate.

- E. The Contractor shall perform bacteriological testing on the water service pipe in accordance with the latest revision of AWWA C65. It requires two water samples, taken at least 16 hours apart. The Contractor, with support from the Engineer, is to collect the samples and submit them to a laboratory approved for bacteriological testing. Samples shall be tested for bacteriological quality in accordance with Standard Methods for the Examination of Water and Wastewater, and shall show the absence of coliform bacteria to be considered acceptable. The Contractor shall be responsible for all costs associated with this bacteriological testing and any retesting necessary.

END OF SECTION 331113

PART 1 – GENERAL

1.1 SUMMARY

- A. The WORK under this Section includes providing all labor, materials, tools, mobilization, demobilization and equipment necessary for furnishing and installing water service valves and water access vaults for the HDPE water service from the connection to the existing 2” HDPE water service to the mechanical room as shown on the Drawings.
- B. This WORK includes all earthwork associated with the installation of water service valve and water access vault.

1.2 SUBMITTALS

- A. Water service curb stop catalogue cuts and certification with NSF 61 requirements.
- B. Water access vault catalogue cuts.

PART 2 – MATERIALS

2.1 CURB STOP

- A. Curb stop shall be Mueller Mark II Oriseal model No. H-10284N brass ball valve or approved equal with compression connections to HDPE pipe.
- B. Curb stops shall come with stainless steel ½” shut off rod and stainless steel cotter pin.

2.2 WATER ACCESS VAULT

- A. Water Access Vault shall be A 24” x 24” precast concrete vault with lid or approved equivalent with stainless steel ½” rod with stainless steel cotter pin.

PART 3 – EXECUTION

3.1 CURB STOPS

- A. Curb stops shall be inspected upon delivery in the field in both open and closed positions prior to installation. Careful inspection shall be made for injury to the outer protective coatings.
- B. Curb stops shall be set on a firm base.
- C. Curb stops shall be set plumb and in conformance with the manufacturers recommendations. Curb stops shall be cleaned free of all foreign matter.

3.2 WATER ACCESS VAULT

- A. Precast concrete water access vault with lid shall be installed over the 2” curb stop, centered over the valve and resting on well-compacted backfill.

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SECTION 33 11 14
WATER SERVICE VALVES

END OF SECTION 331114

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. The WORK under this Section includes providing all labor, materials, tools, mobilization, demobilization and equipment necessary for furnishing and installing pipe insulation for the water supply pipe from the connection to the existing water main to the mechanical room and at locations shown on the Drawings and as directed by the ENGINEER.

1.3 SUBMITTALS

- A. Rigid board insulation certification and catalogue cut sheet.

PART 2 – PRODUCTS

2.1 RIGID INSULATION

- A. Rigid insulation shall be rigid board closed cell polystyrofoam material containing a flame retardant additive specifically designed for underground pipe or pavement installations, equivalent to Dow Chemical Company Styrofoam HI, and approved by the ENGINEER. Rigid board dimensions shall be 2' wide by 8' long by 2" thick. R Valve = 10. Compressive strength = 60 psi.

2.2 SPRAYED-ON INSULATION

- A. Sprayed-on urethane foam insulation applied directly to the pipe exterior with an elastomeric coating, may be approved by the ENGINEER, provided the material has demonstrated a satisfactory performance history in underground installation and has the following physical properties:

Density	2 pcf, Minimum
Compressive Strength (ASTM D 1621)	35 psi, Minimum at 5% Deflective or Yield
Water Absorption (ASTM C 177)	0.25% by Vol. Maximum
Thermal Conductivity (ASTM C 177)	<u>Max. 0.23 BTU</u> Hr.Ft. ² EF.In. Thickness

PART 3 – EXECUTION

3.1 CONSTRUCTION

- A. When water pipes or service pipes have less than 5-feet of cover to finished grade, they shall be insulated as shown on the Drawings.
- B. Rigid insulation shall be a minimum of 2-feet wide and 2-inches thick. The length of insulation required shall be as shown on the Drawings or as directed by the ENGINEER. Insulation shall be placed between 6 and 12-inches from the water pipe or service pipe with the width centered on the longitudinal axis of the water pipe or service pipe as shown on the Drawings.
- C. Sprayed-on urethane foam insulation shall be a minimum of 4-inches thick and be installed in strict conformance to the manufacturer's recommendations. Precautions to protect CONTRACTOR personnel, Project inspectors, and the public in general shall be taken by the CONTRACTOR in compliance with OSHA Standards and the manufacturer's recommendations.

END OF SECTION 331117

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. The WORK under this Section includes providing all labor, materials, tools, mobilization, demobilization and equipment necessary for furnishing and installing 4" PVC sanitary sewer service pipe from the connection to the new sanitary sewer manhole SSMH-1 to the new restroom building, furnishing and installing 4" C900 PVC force main from the connection to the existing force main to SSMH-1, and furnishing and installing 6" PVC from SSMH-1 to the existing 6" PVC sanitary sewer pipe, in accordance with these Specifications and in reasonably close conformity with the lines and grades shown on the Drawings.

1.3 SUBMITTALS

- A. Sanitary Sewer Pipe: Material certifications stating conformance with the requirements of this Section.

PART 2 - PRODUCTS

2.1 PVC SEWER PIPE

- A. PVC Sewer Pipe shall have a standard dimension ratio (SDR) of 35, and conform to ASTM D 3034. Before any PVC pipe is used on this Project, the CONTRACTOR shall supply certifications, signed by an authorized agent of the seller or manufacturer, stating that the material has been sampled, tested, and inspected in accordance with ASTM D 3034.
- B. The pipe shall have integral wall bell and spigot joints conforming to ASTM D 3212. The bell shall consist of an integral wall section with a solid cross-section elastomeric ring, factory assembled, securely locked in place to prevent displacement.
- C. LSS-1 Romac Stainless Steel couplings shall be used to join any existing 6" PVC or 4" C900 PVC sewer pipe together that is cut and reconnected to.

2.2 UNDERGROUND MARKING TAPE

- A. Underground marking tape shall be green, at least four (4) inches wide, four mil thick, polyethylene tape, with a metallic backing capable of being traced with locators. The tape shall have black letters with the following wording: "Caution: Sewer Line Buried Below." The marking tape shall be installed 12 inches above the top of all sewer mains and services.

PART 3 - EXECUTION

3.1 CONSTRUCTION

- A. Excavation, bedding, and backfill shall conform to the requirements of Section 312002 - Trenching. Underground marking tape shall be installed as shown on the Drawings.
- B. Sheeting and bracing required for trenches shall be removed to the elevation of the conduit, but no sheeting will be allowed to be pulled, removed, or disturbed below the conduit. Sheeting and bracing shall meet OSHA requirements.
- C. Before lowering into the trench, the sewer pipe shall be inspected for defects. All cracked, chipped, or broken sewer pipe shall be discarded. The ends and interior of the pipe shall be clean. Belled ends shall be laid upgrade. Handling of the pipe shall be accomplished in a manner that will not damage the pipe. The joint shall be made in the manner recommended by the manufacturer. Care shall be taken not to buckle or disturb previously laid pipe.
- D. Sewer pipe shall be laid accurately to the staked line and grade as indicated on the Drawings. All service connections shall be installed as indicated in the drawings.
- E. Pipe shall be cleaned of all foreign matter, and water shall be kept out of trenches until joints have been completed. When WORK is not in progress, open ends of pipe and fittings shall be securely closed to keep foreign matter and animals from entering.
- F. Each joint shall be inspected to ensure that it is properly made before backfilling is done. Care shall be taken to prevent any dirt or foreign matter from entering the open end of the pipe. Where it is necessary to cut pipe, such cuts shall be neatly made in an approved manner. The laid sewer pipe shall be true to line and grade and, when completed, the sewer shall have a smooth and uniform invert. No section of gravity sewer pipe shall have an adverse grade which would pond water in the invert of the sewer.
- G. Connections to pipe stubs of a different pipe material shall be made with DFW/HPI non-shear-type connector, as shown on the Drawings. Connectors must be approved by the ENGINEER prior to installation.

END OF SECTION 333113

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.
- B. Reference Section 333113 Sanitary Sewer Pipe.

1.2 SUMMARY

- A. The WORK under this Section includes providing all labor, materials, tools and equipment and mobilization and demobilization of any equipment necessary for furnishing and installing a sanitary sewer manhole complete, in place as shown on the Drawings, or as directed by the ENGINEER.

1.3 SUBMITTALS

- A. Manholes: Shop Drawings showing method of construction and reinforcement, pipe invert elevations, and overall structure dimensions.
- B. Frames and Lids: Catalogue cuts and AIS materials certifications for iron or steel products.

PART 2 - PRODUCTS

2.1 MANHOLES

- A. All manholes shall consist of precast concrete sections, including integral base section, riser sections, cones, and flat slab tops and shall conform to ASTM C 478 and the dimensions shown on the Drawings. All precast sections shall have joints sealed with “RAM-NEK” or “RUB-R-NEK” gasketing material, or approved equal, installed as specified by the manufacturer. Cones shall be eccentric. Manhole steps shall be cast in all precast manhole sections. Pipe penetration gaskets shall be cast into all precast manholes. Grade rings shall be standard product, manufactured particularly for use in manhole construction, sized to fit the cones on which they are placed, and the wall thickness shall be not less than that of the cones. Grade rings shall be not less than two inches high, nor more than four inches high. Grade rings shall be Infra-Riser® or approved equal.
- B. Portland cement concrete cast in place shall conform to Section 321314 – Concrete Structures.

2.2 MANHOLE FRAMES, COVERS AND STEPS

- A. Manhole frames and covers shall be watertight, of ductile iron, and conform to the design and dimensions shown on the Drawings. Ductile iron castings shall conform to the requirements of AASHTO M 103. Grade shall be optional unless otherwise designated. Contact surfaces between frames and covers shall be machined to provide a uniform

contact surface. When watertight locking devices are specified, the CONTRACTOR shall submit Shop Drawings for approval by the ENGINEER.

- B. All manhole covers shall have the word "SEWER" cast into the top in letters approximately three inches high.
- C. Manhole steps shall be constructed of polypropylene conforming to ASTM D4101, and shall meet current state and federal safety standards.
- D. Frames and covers shall be ductile iron, conforming to ASTM A 48, Class 30. The cover shall be designed for the appropriate classification of traffic and shall have the word "SEWER" cast into the top with prominent letters. Bearing surfaces between the frame and cover shall be machined to smooth, plane surfaces. Frames and covers shall be Inland Foundry No. 743, or approved equal.

2.3 MISCELLANEOUS

- A. Bentonite-Cement sealing plaster shall consist of two parts bentonite, one part Type 3 cement, and one part sand, with sufficient water to obtain workable consistency.
- B. Mortar shall consist of one part portland cement to two parts clean, well-graded sand which will pass a No. 4 screen. Admixtures may be used not exceeding the following percentages of weight of cement; hydrated lime, 10%; diatomaceous earth or other inert material, 5%. Consistency of mortar shall be such that it will readily adhere to the surface. Mortar mixed for longer than thirty minutes shall not be used. A non-shrink mortar may be submitted for approval as a substitute.
- C. Grout shall be a non-shrink type approved by the ENGINEER.
- D. Pipe penetration gasket through the manhole wall shall be cast-in-place Dura-Seal III, or approved equal, as manufactured by Dura-Tech, Inc., Kor-N-Seal Cavity O-Ring, or approved equal, as manufactured by NPC Inc. shall be used for filling the preformed void in the connection gasket.
- E. Manhole exterior joint waterproofing shall be a Miradri system as manufactured by Carlisle CCW, including Carlisle – CWW 704 primer, CCW Miradri 861 Membrane, and CCW 704 mastic, or approved equal that includes a membrane and adhesive system for positive water exclusion. The membrane shall extend at least 18" each side of manhole joints, except this width may be reduced to 9" each side of manhole joints if the joint is less than four feet below finished grade and the joint is above the maximum water table.

PART 3 – EXECUTION

3.1 CONSTRUCTION

- A. Precast manhole inverts shall be pre-formed as shown on the Drawings.
- B. Precast manhole base sections shall be set on a level base of 12-inches of compacted D-1,

as shown in the Drawings. Provisions shall be made to prevent flotation of the manhole.

- C. All lifting holes shall be plugged with Bentonite-Cement sealing plaster and sealed with a Miradri System patch, or approved equal, to a minimum of six inches from the edges of the opening, as required to prevent leakage.
- D. After completion of the manhole, all plugs shall be completely removed from the sewers and all loose material shall be removed from the manhole.
- E. Service connections shall not be installed into manholes unless otherwise shown on the Drawings or directed by the ENGINEER. Where service connections into manholes are allowed, the top of the service sewer pipe shall be 0.2 feet higher than the top of the downstream main sewer pipe. The manhole invert shall be channeled for the service connection sewers in the same manner as for main sewers.
- F. The manhole exterior joint waterproofing system shall be installed as recommended by the system manufacturer and as described in this Section.
- G. All manholes will be visually inspected by the ENGINEER; there shall be no evidence of leakage of water into any manhole from outside sources or any imperfections which may allow such leakage.
- H. At least 25% of the completed manholes, as selected by the ENGINEER, shall be tested for water-tightness by the CONTRACTOR. The test shall be made, with all connecting pipes plugged, by filling the manhole with clean water to within two inches of the bottom of the cast iron frame. The leakage rate shall not exceed three gallons per day per foot of depth, or fifty gallons per day, whichever is less, over a test period of not less than two hours when the water table is not an adverse factor. For every manhole that fails to meet the test, four additional manholes shall be tested.
- I. If the water table is an adverse factor, the manhole shall be pumped completely dry, all pipes plugged, and then be checked for infiltration. The leakage rate shall not exceed three gallons per day per foot of depth, or fifty gallons per day, whichever is less, over a test period of not less than two hours.

END OF SECTION 333913

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. The WORK under this Section includes providing all labor, materials, tools, mobilization and demobilization and equipment necessary for furnishing, installing and connecting roof drains from the gutter downspout locations and connecting to new storm drain pipe and dry well including all fittings, gutter adaptors, and elbows to make a complete and satisfactory installation in accordance with these Specifications and in reasonably close conformity with the lines and grades shown on the Drawings or as directed by the ENGINEER.
- B. This WORK also includes providing all labor, materials, tools, mobilization and demobilization and equipment necessary for the excavation, filter fabric and backfilling with 2”-4” clean river rock cobbles to complete the construction of the dry wells as shown on the Drawings and as directed by the ENGINEER.

1.3 SUBMITTALS

- A. Storm Sewer Pipe: Material certifications stating conformance with requirements of this section and manufacturer’s catalog cuts of pipe materials and fittings.
- B. Filter Fabric for dry well.

PART 2 – PRODUCTS

2.1 PVC PIPE CONDUIT

- A. PVC Pipe Conduit shall have a standard dimension ration (SDR) of 35 and conform to ASTM D 3034. Before any PVC pipe is used on this Project, the CONTRACTOR shall supply certifications, signed by an authorized agent of the seller or manufacturer, stating that the material has been sampled, tested, and inspected in accordance with ASTM D 3034.
- B. The pipe shall have integral wall bell and spigot joints conforming to ASTM D 3212. The bell shall consist of an integral wall section with a solid cross section elastomeric ring, factory assembled, securely locked in place to prevent displacement.
- C. Flexible watertight connections, approved by the ENGINEER, shall be used at PVC pipe connections to manholes and other rigid structures.

2.2 UNDERGROUND MARKING TAPE

- A. Underground Marking Tape shall be yellow, at least 4-inches wide, 4-mil thick, polyethylene tape with a metallic backing capable of being traced with locators. The tape shall have black letters with the following wording: "Caution: Storm Sewer Line Buried Below", or similar. The marking tape shall be installed 12-inches above the top of all storm sewer pipe or roof gutter connection pipe.

2.3 DRY WELL FILTER FABRIC

- A. Filter fabric to line the dry well shall meet the requirements of the City and Borough of Juneau, Type A Filter Cloth, or approved equal.

PART 3 – EXECUTION

3.1 CONSTRUCTION

- A. Excavation, Bedding, and Backfill shall conform to the requirements of Section 312002 – Trenching. All pipe shall have a minimum cover of 12 inches, unless otherwise shown on the Drawings or directed by the ENGINEER.
- B. The pipe laying shall begin at the downstream end of the pipe. The lower segment of the pipe shall be in contact with the shaped bedding throughout its full length. Bell or groove ends of rigid pipe and outside circumferential laps of flexible pipe shall be placed facing upstream.
- C. Joints shall be made with rubber gaskets.
- D. Flexible conduits shall be firmly joined by approved coupling bands.
- E. Conduit shall be inspected before any backfill is placed. Any pipe found to be substantially out of alignment, unduly settled, or damaged shall be taken up and relaid or replaced.
- F. Installation of all pipes shall conform to the manufacturer's recommended procedures. These Specifications and the Drawings shall take precedence over the manufacturer's recommendations in the event of conflict, if more restrictive.
- G. Pipe culvert shall be installed as shown on the Drawings, unless otherwise directed by the ENGINEER. All bends, couplings and other fittings necessary to connect to existing pipes or flows shall be approved by the ENGINEER.
- H. CONTRACTOR to coordinate with metal gutter downspout installer on exact location of roof gutter downspouts.
- I. Dry wells to be constructed as shown on the Drawings.

END OF SECTION 334100