

Craig City School District

CRAIG HIGH SCHOOL BIOMASS PROJECT



PROJECT MANUAL

January 22, 2021

Prepared for:

Craig City School District
PO Box 800/100 School Rd
Craig, Alaska 99921

Prepared By:

R&M Engineering-Ketchikan, Inc.
7180 Revilla Road, Suite 300
Ketchikan, Alaska 99901



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**CRAIG CITY SCHOOL DISTRICT
INVITATION FOR BID**

CRAIG HIGH SCHOOL BIOMASS PROJECT

NOTICE IS HEREBY GIVEN THAT the Craig City School District (CCSD), is soliciting sealed bids for the following project: **CRAIG HIGH SCHOOL BIOMASS PROJECT**. This project includes the construction of an alteration of an existing prefabricated metal building for the installation of a new biomass boiler system and wood chip storage bunker, and a 840 SF addition for classroom shop space.

To receive the Invitation for Bid (IFB), please contact: 907-826-3274 office of CCSD Superintendent Chris Reitan. Requests for the IFB documents may be emailed to creitan@craigschools.com. The IFB documents will also be posted on the School District's website and The Plans Room. Even though the IFB documents are provided online, each firm must register with the School District by sending an email to: creitan@craigschools.com. **Bids from unregistered bidders will not be accepted.** The required email must include the firm name, address, telephone number, and fax number. No faxed or oral bids will be allowed.

Bid Submission Deadline: To be considered, sealed bids **must be received in the Office of the CCSD Superintendent at PO Box800/100 School Road Craig, AK 99921 by 2:00 P.M. local time, on March 5, 2021.**

CRAIG CITY SCHOOL DISTRICT

Release Date:

By: _____
CCSD Superintendent

INSTRUCTIONS TO BIDDERS

PREPARATION OF BID FORMS.

The Craig City School District, hereinafter referred to as the **OWNER**, invites bids on the form enclosed as part of the bidding and contract documents to be submitted at such time and place as is stated in the Invitation for Bid.

All bids must be submitted in a sealed envelope or box clearly marked on the outside with the project name, and must be delivered to the address outlined, and in the required format, on or before the deadline outlined in the IFB. It is the sole responsibility of the Bidder to see that his bid is received in proper time. **Any bids received after the deadline for receipt of bids will be disqualified and returned to the Bidder unopened. Bids submitted by fax will not be accepted.**

To be considered, bidders must complete, sign, and include the Bid Documentation Forms provided in the IFB with submitted bids.

SIGNATURES.

All proposals shall give the price proposed, both in writing and in figures, shall give all other information requested herein, and shall be signed and dated by the Bidder or his authorized representative. Specifically:

- A. If the proposal is made by an individual, his name, signature and mailing address must be shown.
- B. A bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. Evidence of authority to sign may be in the form of a copy of the partnership agreement or other reliable evidence.
- C. A bid by a limited liability company shall be executed in the name of the firm by a member and accompanied by evidence of authority to sign. Such evidence may be in the form of a copy of the corporate bylaws, articles of incorporation, resolution of the board, corporate certificate, or other reliable evidence.
- D. A bid by a corporation shall be executed in the corporate name by the president, vice-president, or other corporate officer. A certified copy of the bylaws or resolution of the board of directors of the corporation shall be furnished showing the authority of the officer signing the proposal to execute contracts on behalf of the corporation.

MANDATORY PRE-BID CONFERENCE

A pre-bid conference for discussions of the Project, the bidding requirements and other important matters will be held on **February 25th, 2021 at 10:00 am** via Zoom. The pre-bid conference is mandatory. Failure to attend may result in the proposal being rejected as not responsive.

PROJECT SITE VISIT

It is strongly encouraged that prospective Bidders visit the site to view existing conditions. A project site visit is **not** mandatory. To set up a date and time to visit the project site, contact:

Zach Scheidecker
Maintenance Director
Craig City School District
907.965.1722
maintenance@craigschools.com

INQUIRY DEADLINE

Questions, objections, or protests relating to defects, errors, omissions regarding the project or this IFB should be submitted in writing no later than seven (7) days prior to the time announced for opening the proposals for an interpretation or correction thereof. The person submitting the request shall be responsible for its prompt delivery. Any interpretation or correction of the Contract Documents will be made only by Addendum issued by the Project Manager, which shall thereupon become part of the Contract Documents and a copy of such Addendum will be sent by email to each person receiving a set of Contract Documents; however, responsibility shall rest solely with each of the intending Bidders to determine that he has, by time of bidding, received all Addenda. The OWNER will not be responsible for any other explanation or interpretation of the Contract Documents. No oral interpretation of provisions in the Contract Documents will be made to the Bidder. Bidders must satisfy themselves of the accuracy of any of the estimated quantities by examination of the site and a review of the Contract Documents, including Addenda. After bids have been submitted, the Bidder shall not assert that there was a misunderstanding concerning the quantities of work, site or other conditions, or of the nature of the work to be done.

Address questions to:
R&M Engineering-Ketchikan
Nycole Gizinski
Architect
Telephone: 907.225.7917 Ext. 103
Email: nycole@rmketchikan.com

DELIVERY INSTRUCTIONS

Bids must be received by the deadline specified in this IFB.

Be aware that Craig is considered a remote location and, as such, mail and special deliveries by couriers to Craig are commonly delayed beyond the advertised guaranteed arrival of carriers and couriers.

Bids must be delivered to:
Craig City School District (CCSD)
Superintendent
Att: Chris Reitan
Po Box 800/100 School Rd
Craig, AK 99921

INSURANCE AND LEGAL REQUIREMENTS

INSURANCE REQUIREMENTS.

Before execution of a contract, and during the entire period of the project, the contractor shall provide the types of insurance listed below. All policies shall have a mandatory 30-day cancellation clause. The Craig City School District shall be named as additional insured on all insurance policies except professional liability policies. Insurance certificates will be required to be submitted for review by the Craig City School District's Risk Manager before the Craig City School District will issue a notice to proceed. The following insurances are required:

Workers' compensation as required by law and employer's liability coverage at a minimum of \$1,000,000. The Workers' compensation policy shall include a Waiver of Subrogation in favor of the Craig City School District.

Commercial general liability insurance, not excluding explosion, contractual liability or product/completed operation liability insurance - \$1,000,000 per occurrence and \$2,000,000 aggregate.

Comprehensive automobile liability, bodily injury and property damage, including all owned, hired and non-owned, automobile - \$1,000,000 per each accident.

Builder's all risk (course of construction) in the amount of 100% of the total contract amount, including change orders, as well as materials in place and/or stored at the site, whether or not partial payment has been made by the Craig City School District. Deductible to be no more than 10% of the total contract amount.

SURETY REQUIREMENTS

All projects \$25,000 and over are subject to surety requirements as outlined below.

BID BOND: Bidder shall submit with their bid or price bid component, a bid bond accompanied by Power of Attorney, or cashier's check payable to Craig City School District as evidence of good faith and as a guarantee that if awarded the Contract the Bidder will execute the required form of agreement, and give the bonds and other instruments as required. Bids or price bids between \$25,000 and \$100,000 require a surety of 10% of the total bid or price bid. Bids or price bids greater than \$100,000 require a surety of 5% of the bid or price bid. The successful Bidder's bid security will be retained until he has furnished a one hundred percent (100%) performance bond and a one hundred percent (100%) payment bond, if such bonds are not expressly waived by the special conditions, on the forms included in the Contract Documents with a qualified corporate Surety, and the required form of Agreement have been executed by the Bidder and the OWNER and required worker's compensation and other insurance certificates have been provided. The OWNER reserves the right to hold the bid security from the three (3) apparent lowest responsive Bidders until the Agreement is executed by the accepted Bidder and by the OWNER.

PERFORMANCE BOND: Performance Bonds are required on any and all contracts over \$100,000. All performance bonds will be in the amount of 100% of the contract.

PAYMENT BOND: Payment Bonds are required for all construction contracts involving the use of subcontractors, where the total amount of the contract is \$100,000 or more. Payment Bonds shall be in the amount of 100% of the contract amount.

BID, PAYMENT AND PERFORMANCE GUARANTEES: The Bidder whose bid is accepted shall execute the Contract and furnish the required satisfactory performance and payment bonds, and required worker's compensation and other required insurance certificates or policies of insurance and execute the required form of Agreement within ten (10) days after delivery of Notice of Award, or within such additional time as is allowed by the OWNER. The Contract shall be considered executed by the successful bidder when two copies of the Contract, signed by an authorized representative of the Contractor, the bond and required insurance are received by the Purchasing Officer. Failure, neglect or refusal by the Bidder to do so shall constitute a breach of agreement to enter into the Contract effected by the Bidder's proposal and the OWNER's Notice of Award and such Bidder shall be deemed to be a defaulting bidder. The damages to the Owner for such a breach of agreement will include monetary loss from, among other things, interference with the OWNER's program and normal operations. The amount of such damages is difficult or impossible to compute. The OWNER has estimated, and each Bidder, by submitting its Bid proposal, agrees that reasonable compensation for damages resulting from such breach of agreement shall be the amount of the Bid proposal guaranty and promises to pay that amount as liquidated damages for such breach, and the OWNER may retain all such bid security or recover the said amount from the Bidder and Surety.

LABOR AND WAGE RATES

The Contractor shall at all times pay not less than the minimum wage per hour for each classification of laborers, workers, or mechanics as set forth in the general prevailing wage rate schedule applicable at the time the work is performed published by the State of Alaska, as amended from time to time, and shall comply with all other provisions of Alaska Statutes AS 36.05.010 and AS 36.10. Each Bidder, by submitting a bid proposal, acknowledges and represents they have familiarized themselves with the prevailing wage rates and agree to pay and comply with said requirements relating to labor and wage rates.

LICENSES AND REGISTRATION

Before execution of a contract, the successful bidder must have a current State of Alaska business license. Any Bidder or Contractor not so licensed is subject to the penalties imposed by such laws and the Bid Proposal of such Bidders may be rejected.

COMPLIANCE WITH LAWS

The Contractor shall observe and abide by all applicable laws, regulations, ordinances and other rules of the State of Alaska and/or any political subdivisions thereof, or any other duly constituted public authority wherein work is done or services performed, and further agrees to indemnify and save the Craig City School District harmless from any and all liability or penalty which may be imposed or asserted by reason of the Contractor's failure or alleged failure to observe and abide thereby.

BIDDER CERTIFIES

The bidder certifies that any and all prices which may be charged under the terms of this bid request do not and will not violate any existing federal, state, or municipal laws or regulations concerning price discrimination and/or price fixing. The bidder agrees to indemnify, exonerate, and hold harmless the Craig City School District from liability for such violation now and throughout the term of the contract.

ADDENDA ACKNOWLEDGEMENTS

Each proposal shall include specific acknowledgment in the space provided of receipt of all addenda issued during the bidding period. Failure to so acknowledge may result in the proposal being rejected as not responsive.

WRITTEN WORDS

In the case of a difference between written words and figures, the amount stated in written words shall govern. In the case of a difference between a unit price and the extended price, the unit price shall govern.

MODIFICATIONS.

Changes in or additions to the bid forms, recapitulations of the work bid upon, alternative proposals or any other modifications of the bid form which are not specifically called for in the Contract Documents may result in the OWNER's rejection of the bid as not being responsive to the Notice to Contractors Inviting Bids. No oral or telephone modification of any bid submitted will be considered. Any Bidder may modify his bid by submitting a written modification signed by the Bidder or by a signed facsimile communication at Fax No. (907) 826 - 3309 at any time prior to the scheduled bid closing time for receipt of bids, provided such communication is received by the OWNER prior to the bid closing time, and, provided further, the OWNER is satisfied that a written confirmation or facsimile modification over the signature of the Bidder was mailed or shipped via overnight service to the Craig City School District prior to the bid closing time. The modification should not reveal the bid price but should provide the addition or subtraction or other modification so that the final prices or terms will not be known by the Owner until the sealed bid is opened. If written confirmation is not received within three (3) days from the closing time, no consideration will be given to the modification.

ERASURES.

The bid submitted must not contain any erasures, interlineations or other corrections unless each such correction is suitably authenticated by affixing in the margin immediately opposite the corrections the surname of the person or persons signing the bid.

EXAMINATION OF THE SITE, DRAWINGS, ETC.

Each Bidder shall visit the site of the proposed work and fully investigate and acquaint himself with the conditions relating to the work and labor, including taking of soils or other tests, so that he may fully understand the facilities, difficulties, soils and other conditions and restrictions attending the execution of the work under this Contract. Bidders shall thoroughly examine and be familiar with the Contract Documents. The failure or omission of any Bidder to receive or examine any forms, instrument or addendum or other document or to visit the site, take and make soils or other tests, and fully acquaint himself with conditions there existing shall in no way relieve the Bidder from obligations with respect to his bid or to full performance of the Contract and for

the price bid. The submission of a bid shall be taken as conclusive evidence of compliance with this section.

BID PRICE.

The bid price shall include everything necessary for the fulfillment of the Contract including, but not limited to, furnishing all materials and equipment, except as may be provided otherwise in the Contract Documents. In the event of a difference between a price quoted in words and a price quoted in figures for the same quotation, the words shall be the amount bid.

QUALIFICATION OF BIDDERS.

Each Bidder shall be duly licensed, qualified, skilled and regularly engaged in the general class or type of work called for under the Contract. A statement setting forth his licensing, qualification, experience and the experience, knowledge and ability of the personnel available for employment in responsible charge of the work shall be submitted by low Bidder when requested by the OWNER.

It is the intention of the OWNER to award a contract to the lowest responsive responsible Bidder who furnishes satisfactory evidence that he has the requisite licenses, qualifications, experience and ability and that he has sufficient capital, facilities, and plant to enable him to prosecute the work successfully and properly, and to complete the work within the time specified in the Contract.

To determine the degree of responsibility to be credited to the Bidder, the OWNER will weigh any evidence that the Bidder, or personnel available for employment in responsible charge of the work, have satisfactorily performed other contracts of like nature, magnitude and comparable difficulty and comparable rates of progress and other factors, including:

- a) The ability, capacity and skill of the Bidder to perform the Contract.
- b) Whether the Bidder can perform the Contract within the time specified, and without delay
- c) The character, integrity, reputation, judgement, experience and efficiency of the Bidder.
- d) The quality of the Bidder's performance on previous contracts.
- e) The previous and existing compliance by the Bidder with laws and ordinances relating to this and other contracts.
- f) The sufficiency of the financial resources and the ability of the Bidder to perform the Contract.

POSTPONEMENT OF OPENING

The OWNER reserves the right to postpone the date and time for opening of proposals at any time prior to the time announced for opening of proposals in the advertisement.

BID CANCELLATION

The Craig City School District reserves the right to cancel the procurement, IFB, or award without liability to the Bidder, except the return of the bid security, at any time before the Agreement has been fully signed by all parties, including the Craig City School District.

DISQUALIFICATION OF BIDDER

If there is reason to believe that collusion exists among the Bidders, none of the bids of the participants in such collusion will be considered.

REJECTION OF BIDS

The OWNER reserves the right to reject any bid which is nonresponsive, incomplete, obscure or irregular; any bid which omits any one or more items on which the bids are required; any bid in which unit prices are unbalanced in the opinion of the OWNER; any bid accompanied by insufficient or irregular bid security; and any bid from Bidders who have previously failed to perform properly or to complete on time contracts of any nature.

RETURN OF BID BOND

Within ten (10) days after the bids are opened, the OWNER will return the bid security accompanying the proposals which are not to be considered in making the award. All other bid security will be held until the Agreement has been fully executed and the performance and payment bonds and insurance certificates, all on the forms provided and required, have been submitted in proper form to the OWNER, after which they will be returned to the respective Bidders whose proposals they accompany. The bonds or other bid security of the three (3) apparent lowest responsive Bidders may be retained by the OWNER until execution of the Agreement and delivery of the required bonds and insurance certificates by the Bidder whose Bid Proposal is accepted.

AGREEMENT AND BONDS

The form of Agreement which the successful Bidder, as Contractor, shall be required to execute, and the form and amounts of surety bonds which he shall be required to furnish at the time of execution of the Agreement, are included in the Contract Documents and should be carefully examined by the Bidder. The Agreement shall be executed in three (3) original counterparts.

BIDDERS INTERESTED IN MORE THAN ONE BID

No person, firm, or corporation shall be allowed to make, or file, or be interested in more than one bid for the same work unless alternate bids are specifically called for. A person, firm, or corporation that has submitted a sub-proposal to a Bidder, or that has quoted prices or materials to a Bidder, is not thereby disqualified from submitting a sub-proposal or quoting prices to other Bidders or making a prime proposal.

AWARD OF CONTRACT

The OWNER reserves the right to reject any or all bids, waive any informalities or irregularity in the bidding and/or not make an award. The award of the Contract, if made by the OWNER, will be made to the qualified and responsible Bidder submitting the lowest responsive bid, but the OWNER shall determine in its own discretion whether a Bidder is responsible and qualified to perform the Contract, and what bid is the lowest or in the best interest of the OWNER, including the OWNER's right to consider the proposed form of manufacturer's warranty to be given by the manufacturer to be used by a Bidder, if such warranty is called for in the Contract Documents, or

any other matters to be submitted pursuant to the Contract Documents, in making its determinations, and determine whether it is to the best interest of the OWNER to accept the bid.

Alternate bids are intended to provide the Owner a range of comparative costs which will allow identification of the combination most responsive to the Owner's needs and available funds. The Bidder must submit bid prices for all alternate bids. Except as otherwise herein stated an apparent low Bidder will be identified and award of the contract will be made on the basis of the base bid plus those alternate bids that the Owner in its sole discretion elects to accept. The order of the alternates listed shall not be construed as binding and/or an indication of the order in which the Owner may select alternatives if any.

NON-COLLUSION AFFIDAVITS

Upon a specific request of the OWNER, the Bidder, before the award of a Contract, shall submit non-collusion affidavits to the OWNER covering the Bidder and all subcontractors.

DEFAULTING BIDDER

If any Bidder whose Bid proposal is accepted fails, neglects or refuses to furnish the required performance and payment bonds, or the required worker's compensation and other insurance certificates or policies, or to execute the Agreement as herein provided, such Bidder shall not be the lowest responsive Bidder. The OWNER may then select the lowest responsive Bidder and deliver a notice of acceptance of Bid proposal to such lowest responsive Bidder.

ERRORS AND OMISSIONS

No consideration will be given by the OWNER to claim of error in a bid unless such claim is made to the OWNER within twenty-four (24) hours after the time stated for receiving bids in the Notice to Contractors Inviting Bids, and unless supporting evidence of such claim, including cost breakdown sheets, is delivered to the OWNER within forty-eight (48) hours after the time stated for receiving bids in the Notice to Contractors Inviting Bids. Relief may be granted only at the OWNER's discretion and in such event only for clerical errors.

SIGNING

Each document signed by an attorney-in-fact shall be accompanied with a copy of the power of attorney authorizing the attorney-in-fact. No agreement shall be binding upon the OWNER until the same has been completely signed by the Contractor and also signed on behalf of the OWNER. Failure to sign and return the required form of Agreement and acceptable bonds and/or insurance certificates or policies as provided herein and the Contract Documents within the time limit above specified may be just and sufficient cause for the cancellation of the award and the forfeiture of the bid security.

WITHDRAWAL OF BIDS.

Bids may be withdrawn only by written or facsimile notice to 907.826.3309 provided such notice is received prior to the date and time set for the receipt of bids, and, provided further, a written confirmation of the withdrawal is mailed or shipped via overnight service to the Craig City School District prior to the bid closing time. No Bidder may withdraw his bid after the time announced for the opening, or before both the award and execution of the agreement, unless the award is delayed for a period in excess of sixty (60) days.

BID PROTESTS.

An aggrieved bidder may file a bid protest within ten (10) calendar days after Notice of Intent to Award the contract is mailed.

PROJECT OVERVIEW

PROJECT:

Craig High School Biomass Project

PROJECT SITE:

1 Panther Way, Craig, AK 99921

PROJECT SCHEDULE:

Craig High School Biomass Project will advertise for bid in the Ketchikan Daily News the weekends of January 29th, February 6th & 13th.

Note: the project schedule may be modified after the closing date.

- IFB issued: January 29, 2021
- Mandatory Pre-Bid Conference February 25, 2021
- Deadline for questions, objections, or protests relating to defects, error, omissions regarding the project or this IFB February 26, 2021
- IFB closing date: March 5, 2021
- Notice of Intent to Award: March 5, 2021
- Deadline for Appeal of Proposed Award (10 days): March 15, 2021
- Approval of Contract Award by School March 17, 2021

SCOPE OF WORK

Site work consists of regrading and widening an existing walking path for a new gravel access road along with the installation of a new rock retaining wall.

Mechanical work consists of the installation of a new biomass boiler system at new addition and tying into the existing mechanical boiler system of the adjacent main school building.

Electrical work consists of new lighting, power, and heat at additions and for new boiler system. Some modification of existing electrical will be expected.

The shop building and main school building will not be occupied during the project.

Bids are to include all work described in the Craig High School Biomass Project Manual dated January 22, 2021 and the Craig High School Biomass Project Manual drawing bid set dated January 22, 2021.

BID CHECKLIST

This Bid Checklist is a summary of the forms and materials required as part of your firm's bid. Bidders are urged to thoroughly read the entire bid. It may be helpful to use this checklist to help ensure compliance with submission requirements.

PROCEDURAL QUALIFICATIONS

- Bidders must be registered (company name, address, telephone number, and fax number) with the Craig City School District as indicated in this solicitation.
- Bids must be received in the Office of the Superintendent no later than the date and time indicated in the solicitation.

FORM AND CONTENT OF BIDS

- Bids must be in a sealed envelope or box clearly marked with the name of the project on the outside of the envelope or box in order to be considered responsive.
- Bidders must list and acknowledge receipt of any Addenda issued on the Bid Documentation form by signing in the space provided.
- Bidders must fill out the Subcontractors List included in the Bid Documentation indicating the name(s) of any anticipated subcontractors for the proposed project. Use multiple pages if necessary. For portions of the work where a subcontractor will be selected by competitive bids at a later date, enter the type of Work to be subcontracted followed by "To be Determined". For example: "Mechanical – To Be Determined". If the use of subcontractors is not anticipated, N/A or NONE is to be written on the form.
- The Bid Documentation Forms must be signed by an individual authorized to bind the bidder. All bidders, other than individuals, must include evidence of authorization to sign on behalf of the corporation, partnership, limited liability company, or other organization.
- Bidders must attend the pre-bid conference.

Completion of this checklist does not guarantee that a bid will be considered to be responsive. The checklist is provided strictly as a courtesy to bidders.

BID PROPOSAL

TO: Craig City School District:

Pursuant to and in compliance with your Notice to Contractors Inviting Bids, Information For Bidders, Agreement and the other Contract Documents relating thereto, the undersigned Bidder, being fully familiarized with all the terms of all the Contract Documents and with the project site and local conditions and costs affecting the performance as called for in the Contract Documents, hereby proposes and agrees to perform, within the time and in the manner stipulated, the Contract, including all of its component parts, and everything required to be performed, and to provide and furnish any and all of the work, labor, materials, tools, supplies, and all transportation and other services necessary to perform the Contract in a skillful and timely manner, all in strict conformity with the Contract Documents, including addenda(s) for the following project:

CRAIG HIGH SCHOOL BIOMASS BIOLER PROJECT

Award of Contract. The Craig City School District shall have the right to reject this bid proposal and such bid proposal shall remain open and may not be withdrawn for a period of sixty (60) days after the date prescribed for its closing.

Execution of Contract and Performance Security. It is understood and agreed that if written notice of the acceptance of this proposal and award of the Contract is mailed, telefaxed or delivered to the undersigned Bidder within sixty (60) days after the opening of the proposal, or at any time thereafter before it is withdrawn in writing, the undersigned Bidder will execute and deliver the Agreement in the form set forth in the Contract Documents to the Craig City School District in accordance with the proposal as accepted, and will also furnish and deliver to the Craig City School District the performance and payment bonds on the forms provided in the Contract Documents, the Certificate of Insurance and policies of insurance and any other documents or bonds called for in the Contract Documents, all within ten (10) days after notice of acceptance and award of the Contract is given.

Notice of acceptance and award of the Contract or requests or additional information may be addressed to the undersigned Bidder at the business address set forth at the end of this bid.

Wherever in this proposal an amount is stated in both words and figures, in case of discrepancy between words and figures, the words shall prevail; if all or any portion of the proposal is required to be given in unit prices and totals and a discrepancy exists between any such unit prices and totals so given, the unit prices shall prevail.

Bid Security. Accompanying this bid is the required bid security in the form of _____ * in the amount of

_____ (\$ _____)

(*NOTICE: Insert the words, "Cashier's Check," "Certified Check," or "Bid Bond," as the case may be; bid security is five percent (5%) of the total amount bid.)

Receipt of Addenda. Receipt of the following Addenda to the Contract Documents is hereby acknowledged.

<u>ADDENDUM NO</u>	<u>DATE OF RECEIPT OF ADDENDUM</u>	<u>SIGNED ACKNOWLEDGMENT</u>
1	_____	_____
2	_____	_____
3	_____	_____
4	_____	_____

(Note: Failure to acknowledge receipt of any addenda may be considered an irregularity in the proposal and grounds for rejection of the bid.)

BIDDER:

By: _____

Title: _____

Alaska Contractor License No. _____

Company/Firm Name: _____

Telephone: _____

Fax No: _____

Mobile No: _____

Business Address: _____

Email: _____

NOTE: If Bidder is a corporation, the legal name of the corporation shall be set forth above together with the signatures of the officer or officers authorized to sign contracts on behalf of the corporation; if Bidder is a copartnership, the true name of the firm shall be set forth above together with the signature of the partner or partners authorized to sign contracts in behalf of the copartnership, and if Bidder is an individual, the appropriate signature shall be placed above.

Signature of Individual Authorized to Bind the Bidder

Printed Name and Title of Individual Authorized to Bind the Bidder

Date

PRICE PROPOSAL FORM

CRAIG HIGH SCHOOL BIOMASS BIOLER PROJECT

Basis of Award shall be based upon the lowest base bid price. The OWNER reserves the right to award any or all portions of this contract as determined to be in the best interest of the Craig City School District.

- **BASE BID:**

_____ \$ _____
Total in Written Words Total in Dollars

- **ADDITIVE ALTERNATE No. 1:**

_____ \$ _____
Total in Written Words Total in Dollars

- **ADDITIVE ALTERNATE No. 2:**

_____ \$ _____
Total in Written Words Total in Dollars

- **ADDITIVE ALTERNATE No. 3:**

_____ \$ _____
Total in Written Words Total in Dollars

_____ Date _____
Company

_____ Printed Name _____
Signature and Title

SUBCONTRACTOR LIST

SUBCONTRACTORS: The bidder may not subcontract greater than fifty percent of this project without prior written approval of the Craig City School District. List all subcontractors who will be providing greater than 5 percent of the project work and an approximate percentage of their individual participation by discipline. Use additional copies of this form as needed.

SUBCONTRACTORS:

Company/Firm Name: _____

Estimated percentage of subcontractor's participation by discipline: _____

Telephone: _____

Fax No.: _____

Business Address: _____

Company/Firm Name: _____

Estimated percentage of subcontractor's participation by discipline: _____

Telephone: _____

Fax No.: _____

Business Address: _____

Company/Firm Name: _____

Estimated percentage of subcontractor's participation by discipline: _____

Telephone: _____

Fax No.: _____

Business Address: _____

CORPORATE CERTIFICATE

(if applicable)

1. _____, certify that I am the Secretary of the Corporation named as Bidder in the foregoing instrument; that _____, who signed this bid on behalf of the corporation, was then _____ of said Corporation; that the bid was duly signed for and on behalf of said Corporation by authority of its governing body or other authority and is within the scope of its corporate powers.

Signature

CORPORATE ACKNOWLEDGMENT

STATE OF _____)
FIRST JUDICIAL DISTRICT) ss.
)

THIS IS TO CERTIFY that on this _____ day of _____, 2021, before me, the undersigned, a Notary Public in and for the State of _____, duly commissioned and sworn, personally appeared _____ and _____ known to be the _____ and _____ of _____, the corporation which executed the above and foregoing instrument, and who on oath stated they were duly authorized to execute said instrument and acknowledged that they signed the same freely and voluntarily on behalf of said corporation for the purposes therein mentioned.

WITNESS my hand and official seal the day and year in this certificate above written.

NOTARY PUBLIC FOR _____
My Commission Expires: _____

(Seal)

PARTNERSHIP ACKNOWLEDGMENT

(if applicable)

STATE OF _____)
) ss.
FIRST JUDICIAL DISTRICT)

THIS IS TO CERTIFY that on this _____ day of _____, 2021, before me, the undersigned, a Notary Public in and for the State of _____, duly commissioned and sworn, personally appeared _____ and _____ known to be the _____ and _____ of _____, the corporation which executed the above and foregoing instrument, and who on oath stated they were duly authorized to execute said instrument and acknowledged that they signed the same freely and voluntarily on behalf of said corporation for the purposed therein mentioned.

WITNESS my hand and official seal the day and year in this certificate above written.

NOTARY PUBLIC FOR _____
My Commission Expires: _____

(Seal)

LIMITED LIABILITY COMPANY (LLC) ACKNOWLEDGMENT

(if applicable)

STATE OF _____)
) ss.
FIRST JUDICIAL DISTRICT)

THIS IS TO CERTIFY that on this _____ day of _____, 2021, before me, the undersigned, a Notary Public in and for the State of _____, duly commissioned and sworn, personally appeared _____ and _____ known to be the _____ and _____ of _____, the corporation which executed the above and foregoing instrument, and who on oath stated they were duly authorized to execute said instrument and acknowledged that they signed the same freely and voluntarily on behalf of said corporation for the purposed therein mentioned.

WITNESS my hand and official seal the day and year in this certificate above written.

NOTARY PUBLIC FOR _____
My Commission Expires: _____

(Seal)

INDIVIDUAL ACKNOWLEDGMENT

(if applicable)

STATE OF _____)
) ss.
FIRST JUDICIAL DISTRICT)

THIS IS TO CERTIFY that on this _____ day of _____, 2021, before me, the undersigned, a Notary Public in and for the State of _____, duly commissioned and sworn, personally appeared _____ and _____ known to be the _____ and _____ of _____, the corporation which executed the above and foregoing instrument, and who on oath stated they were duly authorized to execute said instrument and acknowledged that they signed the same freely and voluntarily on behalf of said corporation for the purposed therein mentioned.

WITNESS my hand and official seal the day and year in this certificate above written.

NOTARY PUBLIC FOR _____
My Commission Expires: _____

(Seal)

BID BOND

KNOW ALL MEN BY THESE PRESENTS,

That we _____

_____ (Bidder) as **PRINCIPAL**, and _____

_____ (Bonding Company) as **SURETY**, a corporation incorporated in the State of _____ and authorized to do business in the State of Alaska, are held and firmly bound unto the Craig City School District, a municipal corporation, hereinafter called the **OWNER**, as Obligee, in the penal sum of _____ Dollars (\$ _____), for the payment of which sum in lawful money of the United States, well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

WHEREAS the **PRINCIPAL** has, by written proposal, submitted a bid to the said **OWNER** on that certain contract for the performance of the work, services, and materials for which bids are to be opened on _____, 2021, at _____ p.m. for:

CRAIG HIGH SCHOOL BIOMASS BIOLER PROJECT

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH THAT if the aforesaid **PRINCIPAL** shall not withdraw said bid within the period specified therein after the opening of the same, or, if no period be specified, within sixty (60) days after said opening, and, if awarded the Contract, shall within the period specified therefore, or such additional time as is allowed by the **OWNER**, or, if no period be specified, within ten (10) days after the prescribed forms are presented to said **PRINCIPAL** for signature, enter into a written contract with the **OWNER** in the prescribed form, in accordance with the bid as accepted, and delivers to the **OWNER** good and sufficient performance and payment bonds on the forms and as required to guarantee the faithful performance of the terms and conditions of the Contract, and the required certificates or policies of insurance, and other instruments as called for by the Contract Documents, then this obligation shall be null and void; otherwise, it shall be and remain in full force and effect.

IN WITNESS WHEREOF, we have hereunto set our hands and seals on this _____ day of _____, 2021.

PRINCIPAL

By: _____

Title: _____

ATTEST: (If Corporation)

By: _____

Title: _____

Corporate Seal

SURETY

By: _____

Title: _____

(Address)

Corporate Seal

ATTORNEY-IN-FACT ACKNOWLEDGMENT OF SURETY

STATE OF ALASKA)
) ss.
FIRST JUDICIAL DISTRICT))

On this ____ day of _____, 2021, before me, the undersigned, a Notary Public in and for said district and State personally appeared _____ known to me to be the person whose name is subscribed to the within instrument as the attorney-in-fact of, _____, the corporation named as Surety in said instrument, and acknowledged to me that he subscribed the name of said corporation thereto as Surety, and his own name as attorney-in-fact.

NOTARY PUBLIC FOR ALASKA
My Commission Expires: _____

- NOTE:**
- (a) Signatures of those executing for Surety must be properly acknowledged.
 - (b) The Attorney-in-Fact must attach a certified copy of the Power of Attorney.

INSTRUCTIONS

1. This form shall be used whenever a bid bond is required.
2. The surety on the bond may be any corporation or partnership authorized to do business in Alaska as an insurer under AS 21.09. In lieu of furnishing a bid bond, the bidder may submit a certified check, cashier's check or money order payable to the **OWNER** in the amount of the bid bond required.
3. The name, including full Christian name, and business or residence address of each individual party to the bond shall be inserted in the space provided therefor, and each party shall sign the bond with his usual signature on the line opposite the scroll seal.
4. If the principals are partners, their individual names shall appear in the space provided therefor, with the recital that they are partners composing a firm, naming it, and all members of the firm shall execute the bond as individuals.
5. If the principal or surety is a corporation, the name of the State in which incorporated

shall be inserted in the space provided therefor, and said instrument shall be executed and attested under the corporate seal as indicated in the form. If the corporation has no corporate seal the fact shall be stated, in which case a scroll or adhesive seal shall appear following the corporate name.

6. The official character and authority of the person or persons executing the bond for the principal, if a corporation, shall be certified by the secretary or assistant secretary, according to the form herein provided. In lieu of such certificate there may be attached to the bond copies of so much of the records of the corporation as will show the official character and authority of the officer signing, duly certified by the secretary or assistant secretary, under the corporate seal, to be true copies.

7. The date of this bond must not be prior to the date of the instrument in connection with which it is given.

8. Individual Surety will not be accepted as bid security.

AGREEMENT FOR
CRAIG HIGH SCHOOL BIOMASS PROJECT

THIS AGREEMENT made and entered into this ____ day of _____, 2021, by and between the **Craig City School District**, PO Box 800/100 School Rd, Craig, Alaska 99921, hereinafter called "**OWNER**," and _____ licensed and qualified to do business within the State of Alaska, hereinafter called "**CONTRACTOR**."

NOW, THEREFORE, for and in consideration of the terms, covenants, conditions, and provisions contained herein, and attached and incorporated herein and made a part hereof, the parties hereto agree as follows:

Section 1: Scope of Work. The **CONTRACTOR** shall perform and provide, within the time stipulated, the Contract as herein defined, of which this Agreement is a component part, and everything required to be performed including the providing of all work, labor, services, materials, utility, transportation and other acts necessary to perform the Contract in a workmanlike manner (hereinafter referred to as "Construction"), in connection with:

CRAIG HIGH SCHOOL BIOMASS PROJECT

and in strict conformity with the Contract Drawings and Engineering Specifications, including any and all Addenda issued by the **OWNER**, and with all of the other Contract Documents enumerated in Section 4 hereof, hereinafter collectively referred to as the "Contract."

Section 2: Construction Time.

(a) The **CONTRACTOR** agrees to complete all work and construction called for and as defined in the Contract Documents, to the satisfaction of the **OWNER** within the time for completion as specified in these Contract Documents.

Section 3: Contract Amount. As and for full payment, and in consideration of the timely and proper performance of all construction and work called for by the Contract, as defined herein, and performance of all the terms and conditions thereof, the **OWNER** shall pay the **CONTRACTOR** in currency of the United States, as follows:

(a) If the Bid Proposal calls for single lump sum price(s), the **OWNER** shall pay to the **CONTRACTOR** a Total Contract Amount of _____ Dollars(\$_____) to be paid monthly upon **CONTRACTOR'S** progress; the total contract amount shall not exceed **\$XX**. Any increases beyond this amount must be approved through a written change order signed by the authorized representatives of both parties.

(b) If the Bid Proposal calls for unit prices, the **OWNER** shall pay to the **CONTRACTOR** a Total Contract Amount computed from the unit prices set forth in the

CONTRACTOR'S Bid Proposal and the actual quantities of units furnished. It is understood that the quantities stated are approximate only and are subject to either increase or decrease, and should the quantities of any of the units of work and construction be increased, the **CONTRACTOR** shall perform the additional work at the unit prices set forth in the Bid Proposal, and should the quantities be decreased, payment will be made based on the actual quantities installed at the unit prices set forth in the Bid Proposal and the **CONTRACTOR** will make no claim for anticipated profits, or cost recovery for any increase or decrease in the quantities except as specifically provided in the General Conditions. Based upon the unit prices set forth in the **CONTRACTOR'S** Bid Proposal and upon the quantities estimated from the Contract Drawings for bidding purposes, the estimated Total Contract Amount is _____ (\$_____).

It is further agreed that the **CONTRACTOR** shall start all work and construction within ten (10) days after delivery of the **OWNER'S** Notice to Proceed, unless otherwise specified in such Notice to Proceed, and shall complete all work and construction in accordance with the construction schedule and time for completion as provided in the Contract Documents.

Section 4: Contract Documents. The Contract, and the component parts of this Contract, entered into by the acceptance of the **CONTRACTOR'S** Bid Proposal and the signing of this Agreement, consist of the following documents, all of which are component parts of said Contract and are as fully a part thereof as if herein set forth in full, and if not attached, as if attached hereto:

This Agreement with the following Exhibits:

- EXHIBIT A Invitation to Bid;
- EXHIBIT B Information for Bidders;
- EXHIBIT C Notice of Award;
- EXHIBIT D Bid Proposal as accepted;
- EXHIBIT E Contract Forms: Change Orders; Request for Payment; Release; Waiver, and Discharge of all Claims and Liens;
- EXHIBIT F Performance and Payment Bond (will be added after execution)
- EXHIBIT G Addendum No(s). _____;
- EXHIBIT H Notice to Proceed
- EXHIBIT I Certificate of Insurance (will be added after execution);
- EXHIBIT J State of Alaska, Department of Labor, Schedule of Laborer's and Mechanic's Minimum Rates of Pay, dated _____ as hereafter amended from time to time, and available at <http://labor.state.ak.us/1ss/forms/pamp600-040118.pdf> ;
- EXHIBIT K General Conditions;
- EXHIBIT L Special Conditions;
- EXHIBIT M Specifications bearing the title Craig High School Biomass Project consisting of _____ (____) pages.
- EXHIBIT N Contract Drawings, consisting of _____ (____) pages with each sheet bearing the title **Craig High School Biomass Project**.

IN WITNESS WHEREOF, the parties hereto have executed this agreement the day and year first above written.

OWNER:

Craig City School District

Date: _____

By: _____
Chris Reitan
Superintendent

Attest:

By: _____
Name
Title

Certified Funds Available:

By: _____
Name
Business Manager
Account No. XXX-XX-XXX-XXXX

CONTRACTOR NAME:

Name of Contractor

Date: _____

By: _____
(Signature of authorized officer)

(Title of person signing)

SCHOOL DISTRICT ACKNOWLEDGMENT

STATE OF ALASKA)
) ss.
FIRST JUDICIAL DISTRICT)

THIS IS TO CERTIFY that on this ____ day of _____, 2021, before me, the undersigned, a Notary Public in and for the State of Alaska, duly commissioned and sworn, personally appeared _____ and _____ to me known to be the **Superintendent** and the **CCSD Clerk** of the **Craig City School District**, the entity which executed the above and foregoing instrument; who on oath stated that they were duly authorized to execute said instrument and affix the corporate seal thereto on behalf of said entity; who acknowledged to me that they signed and sealed the same freely and voluntarily on behalf of said entity for the uses and purposes therein mentioned.

WITNESS my hand and official seal the day and year in the certificate first above written.

NOTARY PUBLIC FOR ALASKA
My Commission Expires: _____

(Seal)

CORPORATE CERTIFICATE

I, _____ certify that I am the Secretary of the Corporation named as _____ in the foregoing instrument; that _____, who signed said instrument on behalf of said Corporation, was then President of said corporation; that said instrument was duly signed for in behalf of said Corporation by authority of its governing body and is within the scope of its corporate powers.

(Corporate Seal)

(Signature)

CORPORATE ACKNOWLEDGEMENT (if applicable)

STATE OF ALASKA)
) ss.
FIRST JUDICIAL DISTRICT)

THIS IS TO CERTIFY that on this ____ day of _____, 2021, before me, the undersigned, a Notary Public in and for the State of _____, duly commissioned and sworn, personally appeared _____ and _____ (Name)

(Name)
known to be the President and Secretary of _____, a corporation formed under the laws of the State of _____, the corporation which executed the above and foregoing instrument, and who on oath stated he(she)(they) were duly authorized to execute said instrument and affix the corporate seal thereto on behalf of said corporation, and that the seal affixed thereto is the corporate seal thereof, and acknowledged that he(she)(they) signed the same freely and voluntarily on behalf of said corporation for the purposes therein mentioned.

WITNESS my hand and official seal the day and year in this certificate above written.

NOTARY PUBLIC FOR ALASKA
My Commission Expires: _____

(Seal)

INDIVIDUAL ACKNOWLEDGMENT (if applicable)

STATE OF ALASKA)
) ss.
FIRST JUDICIAL DISTRICT)

THIS IS TO CERTIFY that on this ____ day of _____, 2021, before me, the undersigned, a Notary Public in and for the State of Alaska, duly commissioned and sworn, personally appeared * to me known to be the person(s) described in and who executed the foregoing instrument, and acknowledged to me that he/she/they signed and sealed the same freely and voluntarily for the uses and purposes therein mentioned.

WITNESS my hand and official seal the day and year in this certificate above written.

NOTARY PUBLIC FOR ALASKA
My Commission Expires: _____

PARTNERSHIP ACKNOWLEDGMENT (if applicable)

STATE OF ALASKA)
) ss.
FIRST JUDICIAL DISTRICT)

THIS IS TO CERTIFY that on this ____ day of _____, 2021, before me, a Notary Public, personally appeared _____ known to me to be (one of) the partner(s) of the partnership that executed the within instrument, and acknowledged to me that such partnership executed the same.

DATED: _____

NOTARY PUBLIC FOR ALASKA
My Commission Expires: _____

(Seal)

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS:

WHEREAS, the School Board of the Craig City School District, Alaska, by motion passed _____, has awarded to _____, (hereinafter designated as the **PRINCIPAL**), a contract for the work described as follows:

CRAIG HIGH SCHOOL BIOMASS PROJECT

WHEREAS, under the terms of said contract, **PRINCIPAL** is required before entering upon the performance of the work, to file a good and sufficient payment bond with the **Craig City School District** (hereinafter referred to as "**OWNER**") to secure the payment of the claims to which reference is made in Title 36, Chapter 25, commencing at Section 36.25.010, Statutes of the State of Alaska.

NOW THEREFORE, we, the **PRINCIPAL** and _____, as **SURETY**, are held and firmly bound unto the **OWNER** and any and all persons, companies or corporations furnishing materials, provisions, provender, or other supplies, used in, upon, or about the performance of the work contracted to be executed or performed under the hereinabove mentioned contract, and all persons, companies, or corporations renting or hiring implements or machinery, for or contributing to said work to be done, and all persons performing work or labor done upon the same, and all persons supplying both work and labor as aforesaid, and as referred to in said Chapter 25, Title 36, Statutes of the State of Alaska, in the penal sum of _____ Dollars (\$ _____) 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, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH THAT if said **PRINCIPAL**, hers/his/its subcontractors, heirs, executors, administrators, successors and assigns, shall pay any and all persons, companies or corporations furnishing materials, provisions, provender, or other supplies, used in, upon, or about the performance of the work contracted to be executed or performed under the hereinabove mentioned contract, and all persons, companies, or corporations renting or hiring implements or machinery, for or contributing to said work to be done, and all persons performing work or labor done upon the same, and all persons supplying both work and labor as aforesaid, and as referred to in said Chapter 25, Title 36, Statutes of the State of Alaska, and shall indemnify and save the **OWNER** harmless from all cost, expense, and damage by reason of **PRINCIPAL'S** default or failure to do so, and shall pay any local sales or use taxes, then this obligation shall be void; otherwise said bond shall remain in full force and effect and **SURETY** on this bond shall pay the same.

It is expressly agreed and understood that in addition to **OWNER**, this bond shall inure to the benefit of any and all of the persons named in Alaska Statutes, Title 36, Chapter 25, Sections 36.25.010, 36.25.020, and AS 23.20.265, et seq., so as to give a right of action to such persons or

their assigns in any suit brought upon this bond.

It is further stipulated and agreed that the **SURETY** on this bond shall not be exonerated or released from the obligation of this bond by any change, extension of time for performance, addition, alteration or modification in, to, or of any contract, plans, specifications, or agreement pertaining or relating to any scheme or work of improvement hereinabove described or pertaining or relating to the furnishings of labor, materials, or equipment therefor, nor by any change or modification of any terms of payment or extension of the time for any payment pertaining or relating to any scheme or work of improvement hereinabove described, nor by any rescission or attempted rescission of the contract, agreement or bond, nor by any conditions precedent or subsequent in the bond attempting to limit the right of recovery of claimants otherwise entitled to recover under any such contract or agreement or under the bond, nor by any fraud practiced by any person other than the claimant seeking to recover on the bond and that this bond be construed most strongly against the **SURETY** and in favor of all persons for whose benefit such bond is given, and under no circumstances shall **SURETY** be released from liability to those for whose benefit such bond has been given by reason of any breach of contract between the **OWNER** and the **PRINCIPAL** or on the part of any obligee named in such bond, but the sole conditions of recovery shall be that claimant is a person described herein and/or in Alaska Statutes Title 36, Chapter 25, Section 36.25.010, 36.25.020, et seq., and has not been paid the full amount of his claim and that **SURETY** does hereby waive notice of any such change, extension of time, addition, alteration or modification herein mentioned.

As a part of the obligation secured hereby and in addition to the face amount specified therefor, there shall be included costs and reasonable expenses and fees, including reasonable attorney's fees, incurred by **OWNER** or other person entitled to bring suit thereon in enforcing such obligation, all to be taxed as costs and included in any judgment rendered.

IN WITNESS WHEREOF this instrument has been duly executed by the Principal and Surety above named, on the _____ day of _____, 2021.

PRINCIPAL

By: _____

Title: _____

TWO WITNESSES:

ATTEST: (If Corporation)

By: _____

Title: _____

Corporate Seal:

SURETY

By: _____

Title: _____

ADDRESS

ATTORNEY-IN-FACT ACKNOWLEDGMENT OF SURETY

STATE OF ALASKA)
) ss.
FIRST JUDICIAL DISTRICT)

On this ____ day of _____, 2021, before me, _____, a notary public in and for said district and State, personally appeared _____ known to me to be the person whose name is subscribed to the within instrument as the attorney-in-fact of the _____, the corporation named as Surety in said instrument, and acknowledged to me that he subscribed the name of said corporation thereto as Surety, and his own name as attorney-in-fact.

NOTARY PUBLIC FOR ALASKA
My Commission Expires: _____

- NOTE:**
- (a) Signature of those executing for Surety must be properly acknowledged.

 - (b) The Attorney-in-fact must attach a certified copy of the Power of Attorney

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS:

WHEREAS, the School Board of the Craig City School District, Alaska, by motion passed _____ has awarded to _____ hereinafter designated as the **PRINCIPAL**, a contract for:

CRAIG HIGH SCHOOL BIOMASS PROJECT

WHEREAS, said **PRINCIPAL** is required under the terms of said contract to furnish a bond for the faithful performance of said contract,

NOW, THEREFORE, we, the **PRINCIPAL** and _____, as **SURETY**, are held and firmly bound unto Craig City School District hereinafter called the **OWNER**, in the penal sum of _____ Dollars (\$)) 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 if the above bounden **PRINCIPAL**, his or its heirs, executors, administrators, successors or assigns, shall deliver, provide and perform all work, services, and materials, and in all things stand to and abide by, and well and truly keep and perform the covenants, conditions and agreements in the said contract, and any alteration thereof made as therein provided, on his or its part, to be kept and performed at the time and in the manner therein specified, including any warranty, or guarantee, and during the period thereof, as provided for therein, and in all respects according to their intent and meaning, and shall indemnify and save harmless the **OWNER**, its officers and agents, as therein stipulated, then this obligation shall become null and void; otherwise it shall be and remain in full force and effect.

And 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 contract documents, or the work to be performed thereunder, or the specifications accompanying the same, shall in any way affect its obligations on this bond, and said **SURETY** does hereby waive notice of any such change, extension of time, alteration, modifications, or additions to the terms of the contract or contract documents, or to the work or to the specifications.

As a part of the obligation secured hereby and in addition to the face amount specified therefor, there shall be included costs, expenses and fees, including attorney's fees, incurred by **OWNER** in enforcing such obligation, all to be taxed as costs and included in any judgment rendered.

IN WITNESS WHEREOF _____ identical counterparts of this instrument, each of which shall for all purposes be deemed an original thereof, have been duly executed by the **PRINCIPAL** and **SURETY** above named, on the _____ day of _____, 2021.

TWO WITNESSES:

PRINCIPAL

By: _____

Title: _____

Corporate Seal

SURETY

By: _____

Title: _____

ADDRESS

Corporate Seal

ATTORNEY-IN-FACT ACKNOWLEDGMENT OF SURETY

STATE OF ALASKA)
) ss.
_____ JUDICIAL DISTRICT)

On this _____ day of _____, 2021, before me, _____, a notary public in and for said district and State personally appeared _____ known to me to be the person whose name is subscribed to the within instrument as the attorney-in-fact of, _____, the corporation named as Surety in said instrument, and acknowledged to me that he subscribed the name of said corporation thereto as Surety, and his own name as attorney-in-fact.

NOTARY PUBLIC FOR ALASKA
My Commission Expires: _____

(Seal)

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GENERAL CONDITIONS

Section 1: DEFINITIONS.

(a) **ACT OF GOD** shall mean an earthquake, flood, cyclone or other cataclysmic phenomenon of nature. A rain, windstorm, high water or other natural phenomenon of unusual intensity for a specific locality, but which might reasonably have been anticipated from historical records of the general locality, shall not be construed as an Act of God.

(b) **ADDENDA** shall mean written modifications of the Contract Documents which may be issued by the Owner to holders of Contract Documents prior to opening Proposals.

(c) **BIDDER** shall mean any person, partnership, firm or corporation that submits a Bid Proposal and Bid Bond, if required, to the Owner.

(d) **CHANGE ORDER** shall mean a written supplemental agreement executed by the Owner and the Contractor to modify the Contract at the time of or after its execution.

(e) **CONSTRUCTION** shall mean:

1. All management, superintendence, labor, materials, use of equipment and tools, transportation and other facilities or services necessary to complete the Contract.

2. If the Contract includes the furnishing of manufactured equipment, "Construction" shall also include all management, superintendence, labor, materials, equipment components, tools, inspection, testing transportation and other facilities and services necessary to design, manufacture, fabricate, assemble, deliver and install equipment and complete the Contract.

3. Without limiting the generality of the foregoing, "Construction" shall also include delivery to the location of the job site all management, superintendence, labor, materials, equipment, tools, transportation and other facilities and services necessary to complete the Contract.

(f) **CONTRACT** shall mean the whole understanding between the Owner and the Contractor covering the furnishing of the construction and payment therefor and described or encompassed in the Contract Documents, including any addenda or change orders.

(g) **CONTRACT DOCUMENTS** shall mean the documents enumerated in the agreement which form the Contract.

(h) **CONTRACT DRAWING** shall mean a diagrammatic or pictorial description of the construction to be furnished, or copies thereof, which is included as a part of the Contract Documents as modified by Addenda and Change Orders to the Contract. Contract Drawings shall include Proposal Drawings issued to Bidders to delineate the scope of the construction and Construction Drawings issued to the Contractor during construction to further describe the details of the Project design.

(i) **CONTRACTOR** shall mean the person, partnership or corporation whose Bid Proposal has been accepted by the Owner and who has furnished suitable Performance Bond and Payment Bond, Insurance Certificate or Insurance Policies, Lump Sum Bid Breakdown and executed the Agreement.

(j) **ENGINEER** shall mean the duly authorized employee of the Owner or an engineer, architect or other consultant contracted to the Owner and authorized to perform the engineering or contract administration functions contemplated herein.

(k) **ENGINEERING SPECIFICATIONS** shall mean written descriptions, including performance, of the construction to be furnished which are part of the Contract Documents.

(l) **ENGINEER'S INSTRUCTION** shall mean a written interpretation of the Contract issued by the Engineer for the guidance of the Contractor.

(m) **OR EQUAL** shall mean construction items or materials substantially equal to that specified in the Contract Documents. The Engineer shall be the sole judge of the quality and suitability of proposed substitutions.

(n) **OWNER** shall mean the CRAIG CITY SCHOOL DISTRICT whose address is PO BOX 800/100 School Rd., Craig, Alaska 99921.

(o) **PERFORMANCE AND PAYMENT BONDS** shall mean the form of Performance Bond and the form of Payment Bond included in the Contract Documents which shall be furnished by the Contractor and its Surety as assurance to the Owner that the Contractor will furnish, pay for, and warrant the construction and perform all the requirements of the Contract.

(p) **PROJECT** shall mean the improvements and/or facility to be completed in whole or in part through the performance of the Contract.

(q) **BID PROPOSAL** shall mean a Bidder's offer to the Owner to contract for and undertake furnishing the construction for one (1) or more Bid Schedules.

(r) **SHOP DRAWING** shall mean a diagrammatic, pictorial or written description of the details of proposed materials, equipment components, construction, adjustment or operation, except drawings containing proprietary information, prepared by the Contractor or a Subcontractor and submitted for the review of the Engineer to demonstrate that the construction when completed will meet the requirements of the Contract.

(s) **SUBCONTRACTOR** shall mean an independent person, partnership or corporation, other than an employee of the Contractor, supplying to and under agreement with the Contractor or any Subcontractor of the Contractor, any construction or equipment in connection with the Contract.

(t) **SUBSTANTIAL COMPLETION** shall mean that degree of completion of the

construction necessary for the Project to function and operate at its intended location and for its intended use. Written approval of administrative authorities having jurisdiction approving occupancy by Owner for intended use must be submitted by Contractor as a condition of any determination of Substantial Completion.

(u) **SURETY** shall mean a corporation executing a Bid Bond, Performance Bond, Payment Bond or other bond payable to the Owner.

(v) **UNITS OF CONSTRUCTION.**

1. "Basic Unit of Construction" shall mean an elementary part of the total construction which includes like materials and labor, is repetitive in nature, and is readily and economically measurable, i.e., "cu. yd. of concrete in place," "lin. ft. of pipe installed," or "lb. of reinforcing steel furnished."

2. "Integrated Unit of Construction" shall mean a part of the total construction which combines various quantities of unlike materials, equipment and labor into a separate piece of construction where the component materials, equipment and labor are not in themselves readily and economically measurable, i.e., "road bridge complete" includes excavation, concrete, bridge work, backfill, etc.

(w) **UNIT PRICE** shall mean the amount bid by the Contractor for furnishing one (1) unit of construction, the quantities being subject to adjustment within the limits specified in the Contract Documents.

(x) **WRITTEN NOTICE** shall mean a handwritten or typewritten communication delivered in person, or sent to the individual, or to a partner of the partnership, or to an officer of the corporation, which is the Contractor, at the address set forth in the Contractor's Bid Proposal or, if to the Owner, addressed to the CCSD Superintendent, PO Box 800/100 School Rd, Craig, Alaska 99921, or such other address as may be specified for such purpose in writing by the Contractor or Owner.

Section 2: REFERENCED SPECIFICATIONS AND ABBREVIATIONS.

(a) Any material specified by reference to number, symbol or title of a specific standard such as a code, commercial standard, Federal Specification, trade association standard, or other similar standard, shall comply with the requirements of the issue in effect on the date of the Notice to Contractors Inviting Bids unless a specific issue is indicated in the special conditions or Engineering Specifications.

(b) Those applicable provisions of and such specifications which are referred to as provided in (a) above, except as modified in the Engineering Specifications, shall have full force and effect as though included in the Engineering Specifications.

(c) The following is a general list of abbreviations which may appear on the Contract Drawings or in the Engineering Specifications.

AAMA	Architectural Aluminum Manufacturers' Association
AAN	American Association of Nurserymen
AAR	Association of American Railroads
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AEIC	Associated Edison Illuminating Companies
AGC	Associated General Contractors of America
AFBMA	Anti-Friction Bearing Manufacturers' Association
AGA	American Gas Association
AGMA	American Gear Manufacturers' Association
AIA	American Institute of Architects
AIEE	American Institute of Electrical Engineers
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Construction
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute
APA	American Plywood Association
API	American Petroleum Institute
APWA	American Public Works Association
ARA	American Railway Association
AREA	American Railway Engineering Association
ASCE	American Society of Civil Engineers
ASE Code	American Standard Safety Code for Elevators, Dumbwaiters and Escalators
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASLA	American Society of Landscape Architects
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWPA	American Wood Preservers' Association
AWS	American Welding Society
AWWA	American Water Works Association
CSI	Construction Specification Institute
DCDMA	Diamond Core Drill Manufacturers' Association
DEMA	Diesel Engine Manufacturers' Association
EEI	Edison Electric Institute
EIA	Electronic Industries Association
EJMA	Expansion Joint Manufacturers' Association
FHWA	Federal Highway Administration
Fed.Spec.	Federal Specifications
FSS	Federal Specifications and Standards General Services Administration
F.S. Std.Specs.	Forest Service Standard Specifications for Construction of Roads and Bridges, E,-7720-100, 1979, Forest Service U.S. Department of Agriculture, Washington, D.C. 20013
ICC	Interstate Commerce Commission
IEEE	Institute of Electrical and Electronics Engineers

IES	Illuminating Engineering Society
ICEA	Insulated Cable Engineers' Association
JIC	Joint Industrial Council
NBS	National Bureau of Standards
NEC	National Electrical Code
NEMA	National Electrical Manufacturers' Association
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
PCI	Prestressed Concrete Institute
SAE	Society of Automotive Engineers
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association, Inc.
SPR	Simplified Practice Recommendation
SSPC	Steel Structures Painting Council
TCA	Tile Council of America
TEMA	Tubular Exchanger Manufacturers' Association
UBC	Uniform Building Code
UL	Underwriters' Laboratories, Inc.
USASI	United States of America Standards Institute
WCLA	West Coast Lumbermen's Association
WWPA	Western Wood Products Association

Section 3: SUBCONTRACTS.

(a) The Contractor shall perform with its own organization not less than one-third (1/3) of the total monetary amount of the Contract and shall not sublet to any one (1) Subcontractor more than one-half (1/2) of the total monetary amount of the Contract without the previous written consent of the Owner. After execution of the Contract and prior to the beginning of operations on a subcontract, the Contractor may, if approved by the Owner through execution of a Change Order, employ a different Subcontractor than was offered in the Contractor's Bid Proposal. In this event the Total Contract Amount shall be reduced by an amount equal to the reduction, if any, in the cost to the Contractor as a result of the change of Subcontractor. The Contractor shall furnish to the Owner the detailed bids of both Subcontractors before execution of the Change Order.

(b) The Contractor shall be fully responsible to the Owner for the acts, errors and omissions of Subcontractors and of persons either directly or indirectly employed by them. The Contractor shall include all applicable provisions of these Contract Documents in all subcontracts for construction to be performed under this Contract.

(c) Nothing contained in the Contract Documents shall create any contractual relationship between any Subcontractor and the Owner. The Owner's consent to or approval of any Subcontractor under the Contract shall not relieve the Contractor of its obligations under the Contract and no such consent or approval shall be deemed to waive or modify any provisions of the Contract.

Section 4: PERFORMANCE AND PAYMENT BONDS.

(a) Within ten (10) days after the Contractor receives the Notice of Award, and prior to the execution of the Contract by the Owner, the Contractor shall furnish a Performance Bond and also a Labor and Materials Payment Bond, on the forms included in the Contract Documents, with a corporate Surety satisfactory to the Owner, which bonds shall insure the full and faithful performance of the Contract, including payment of all obligations arising thereunder, and each bond shall be in an amount equal to one hundred percent (100%) of the total contract amount unless otherwise provided in the Special Conditions.

(b) The Surety on such Performance Bond and Labor and Material Payment Bond shall be a duly licensed surety corporation authorized to do business in the State of Alaska and shall be 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 Accounts, U.S. Treasury Department. All bonds signed by an agent must be accompanied by a certified copy of the authority to act.

(c) Failure to timely provide the bonds on the required bond forms and as required herein shall be grounds for the Owner rescinding the award and awarding to another bidder or rejecting all bids. The Contractor in such event forfeits the Contractor's bid security.

Section 5: EMERGENCY CONSTRUCTION.

If, in the opinion of the Owner, and the Contractor is so advised, certain emergency construction must be done immediately to safeguard life or property or to protect completed construction, or the building or site where work is to be performed, the Contractor shall proceed at once with such emergency construction. The omission or failure of the Owner to form such an opinion or to advise the Contractor shall not excuse the Contractor from any obligation to safeguard life or property or to protect completed construction, or the buildings or site where work is to be performed. If such emergency construction is within the scope of the Contract, or is to protect completed construction, and is not caused by the negligence or acts or omissions of the Contractor, its employees, agents, representatives or subcontractors, the Contractor shall be paid as provided in the Contract. If such emergency construction is outside the scope of the Contract, the Contractor shall submit a written proposal within ten (10) days after commencement of the emergency construction and the construction shall be paid for as a change in construction; provided, however, the Owner shall have no obligation to compensate the Contractor for emergency construction required because of the Contractor's negligence or acts or omissions of the Contractor, its employees, agents, representatives, subcontractors, or other persons for whose acts the Contractor is liable or responsible. Failure to submit such a proposal within the specified time shall constitute waiver of any claim based upon such emergency construction.

Section 6: CONTRACTOR'S DEFAULT.

(a) If the Contractor becomes insolvent, is adjudged bankrupt or makes an assignment for the benefit of its creditors, or if a receiver, assignee or other liquidating officer is appointed for the Contractor, or if the Contractor fails to prosecute the work according to the Construction Schedule,

or otherwise, or persistently or repeatedly refuses or fails to supply satisfactory superintendence, satisfactory numbers of properly skilled workmen or satisfactory construction or fails to make payment to employees or Subcontractors or payment for materials or equipment when due, or violates any law, ordinance, rule or regulation of any governmental authority having jurisdiction, or otherwise is in violation of any provisions of the Contract, the Contractor shall be in default under the Contract, and if such default continues for a period of ten (10) days after written notice thereof is served by the Owner upon the Contractor, the Owner, without prejudice to any other right or remedy, including termination, may declare the Contractor to be in default under the Contract by written notice thereof served upon the Contractor and its Surety.

(b) In the event of such declaration of default, the Surety shall have the obligation immediately to remedy the default or to undertake performance of the Contractor's obligations under the Contract; provided, however, that if the Surety does not remedy the default or does not undertake such performance within fifteen (15) days from the date of service of such declaration of default, the Owner may, but shall not be required to take possession of the construction and of all the Contractor's equipment, tools and materials used in connection therewith and complete the construction by whatever method the Owner may deem expedient. In such event, the Contractor shall not be entitled to receive any further payment until the construction is completed. If the unpaid balance of the total contract amount exceeds the cost to the Owner of completing the Contract, including reasonable compensation for additional administrative, engineering and legal costs of the Owner, and any damages incurred by the Owner by reason of such default, such excess shall be paid to the Contractor. If the cost to the Owner of completing the Contract, including reasonable compensation for additional administrative, engineering and legal costs of the Owner, exceeds such unpaid balance, the Contractor shall immediately pay the excess to the Owner. The foregoing provisions are in addition to and not in limitation of any other rights or remedies available to the Owner, including termination for default.

Section 7: LIQUIDATED DAMAGES.

(a) For each and every calendar day that any portion of the work and construction is not completed after the Construction Time fixed for completion in the Contract Documents, the Contractor shall pay the Owner, not as a penalty but as liquidated damages, such amount per calendar day as is specified in the Special Conditions.

(b) Because the difficulty in computing the actual damages which will result from failure to complete the construction on time, the said amount of liquidated damages is hereby estimated, agreed upon and determined in advance by the parties hereto as a reasonable evaluation of the actual damages which the Owner will suffer for each and every day during which the completion of the construction is delayed beyond the Construction Time herein fixed.

(c) Such monies due the Contractor, or to become due the Contractor at or after the Construction Time fixed in the Contract Documents, for all or any part of the construction, as may be necessary to pay said liquidated damages, may be retained by the Owner, and if such amounts are not sufficient to pay such liquidated damages, the Contractor shall immediately pay the deficiency to the Owner. Such deductions or amounts retained by the Owner shall not in any degree release the Contractor from further obligation and liability with respect to fulfilling the entire Contract.

(d) Nothing herein shall be construed to preclude claims by the Owner for damages caused by Contractor errors, omissions, or negligence unrelated to time delay in completing the construction on time.

Section 8: CONTRACTOR'S CLAIMS PRIOR TO SUBSTANTIAL COMPLETION.

(a) Written notice of any condition or event for which a claim is subsequently to be made by the Contractor shall be made to the Owner in writing within two (2) days after the first observance of such condition or event. A written claim for damages or additional compensation setting forth in full detail the labor, material and other costs and the total amount of the claim and the reasons therefor, shall be given to the Owner by the Contractor, with a copy to the Engineer, within fifteen (15) days after the first notice of such condition or event and if such condition or event continues, a similar written claim shall be presented every thirty (30) days thereafter. The Contractor expressly agrees that failure to give such notice of such condition or event and to present such detailed claims within the times specified shall constitute a binding waiver of any claim based upon such condition or event. Knowledge of the condition or event on the part of the Owner shall not affect the requirements for such written notice and written claims within the specified times.

(b) The Contractor shall not cause a delay of construction during any dispute. If the Owner orders a modification of the Contract by issuing a Change Order which becomes a subject of dispute or if any interpretation of the Contract Documents, or Engineer's Instructions, becomes a subject of dispute, the Contractor, upon written notice from the Owner, shall proceed with the construction as modified by the disputed Change Order during the period required to resolve the dispute.

(c) Claims for additional payment for delay in the construction caused by any act or omission of the Owner shall be limited to damages, if any, sustained during the time reasonably required for the Contractor to discharge its employees and to move equipment to another construction project location which, in the opinion of the Engineer, is suitable for operations by such equipment. In no event shall such time exceed two (2) weeks for each such occurrence.

Section 9: CONTRACTOR'S CLAIMS AFTER TERMINATION, SUBSTANTIAL COMPLETION OR DECLARATION OF CONTRACTOR'S DEFAULT.

(a) When in the opinion of the Engineer the Contract is substantially completed, the Owner will send to the Contractor, by registered or certified United States mail, a written Opinion of Substantial Completion. Within thirty (30) days after delivery of such Opinion of Substantial Completion, and also in the event of a declared default of the Contractor or termination of the Contract before substantial completion, the Contractor shall give the Owner written notice of any claim it intends to make against the Owner arising out of or in relation to the Contract; provided, that written notice of a claim based upon an event which occurs after receipt by the Contractor of the Opinion of Substantial Completion may be so given within thirty (30) days after the occurrence of the event upon which the claim is based but in no event later than thirty (30) days after Owner has given Notice of Acceptance of the Construction. The notice of claim shall state the amount

claimed and shall specify in detail the nature, grounds and manner of computation of the amount of the claim. The fact that the Contractor has given any notice or presented any claim required by any other provision of the Contract shall not relieve it from giving the notice required by this section of the Contract nor shall giving the notice required by this section relieve the Contractor from the effect of failure to give any notice or present any claim as required by any other paragraph or section of the Contract.

(b) Within sixty (60) days after receipt of such notice of claim, the Owner will give the Contractor written notice that the claim is allowed or rejected or allowed in part and rejected in part. Any claim or part thereof so allowed shall constitute an acknowledged obligation of the Owner under the Contract payable in due course. Failure to give such written notice of allowance or rejection within sixty (60) days after the Owner receives the notice of claim shall constitute rejection thereof in full. The Contractor shall not start suit on any claim until the Owner has rejected the claim in whole or in part or has been accorded sixty (60) days in which to allow or reject the claim as above provided.

(c) The parties hereto expressly agree that the Contractor shall have thirty (30) days after receipt of written notice that the claim has been rejected in whole or in part, or ninety (90) days after the notice of claim is received by the Owner in case no notice of rejection is given, to bring suit against the Owner in the appropriate court sitting in the City of Ketchikan, First Judicial District, State of Alaska, and that otherwise, the claim, except the portion thereof allowed by the Owner, shall be forever barred. No suit shall be brought against the Owner on any claim arising out of or in connection with the Contract unless the requirements of this section applicable to the Contractor have been strictly complied with.

Section 10: ASSIGNMENT OF CONTRACT.

The Contractor shall not assign, transfer, convey, pledge, hypothecate, or otherwise dispose of or encumber this Contract, or any rights thereunder, without the prior written consent of the Owner. Any such attempted assignment, transfer, conveyance, pledge, hypothecation, or other disposition shall be null and void and of no force or effect. No assignment of the Contract or funds due under the Contract by the Contractor with the consent of the Owner shall be valid unless it contains a provision that the funds to be paid to the assignee under the assignment are subject to all the Contractor's obligations under the Contract.

Section 11: WAIVER OR MODIFICATION.

The failure of either party to the Contract to insist upon strict performance of any of the terms or provisions of the Contract Documents shall not constitute a waiver or relinquishment of any such terms or provisions, but the same shall be and remain in full force and effect. The making of any payment by the Owner to the Contractor, with or without knowledge of any default or breach of the Contract, shall not be deemed to be a waiver as to any default or breach of any term or provision of the Contract Documents. No waiver or modification of any term or provision of the Contract Documents shall be claimed by the Contractor unless the same be made by Change Order, and no such waiver or modification shall constitute a waiver or modification of any other term or provision.

Section 12: SEVERABILITY AND HEADINGS.

(a) If any part of the Contract Documents, including, but not limited to, any provision, paragraph, clause, phrase or words, is found to be in conflict with applicable law, such part shall be inoperative, null and void insofar as it is in conflict with said law, but the remainder shall be given full force and effect.

(b) The descriptive headings of the various parts, sections, paragraphs, and other portions of the Contract Documents have been inserted for convenience of reference only and shall in no way modify or restrict any of the terms and provisions of the Contract Documents.

Section 13: INTENT OF CONTRACT DOCUMENTS.

(a) Except as otherwise provided in the Special Conditions, the intent of the Contract Documents is to include all plant, materials, equipment, tools, supplies, management, superintendence, Contractor's design and detailing, work, labor, transportation, fuel, power, water and all other utilities and services necessary for furnishing all of the construction required for the proper performance of the Contract.

(b) Except as may be otherwise provided in the Special Conditions, the intent of the Contract Documents is to specify and set forth a complete and operating unit or system ready for use regardless of whether or not every detail has been set forth in the Contract Documents. Any omission of details from the Contract Documents shall not be construed to mean that they are to be omitted by the Contractor or to affect in any way the completeness of the construction. The cost of such details shall be included in the prices in the Bid Proposal.

Section 14: DISCREPANCIES IN CONTRACT DOCUMENTS.

(a) If at any time the Contractor discovers that there is possible error, omission or discrepancy in any of the Contract Documents, the Contractor shall immediately notify the Engineer in writing. The Engineer shall promptly review the alleged error, omission or discrepancy and issue an Engineer's Instruction or the Owner may issue a Change Order. Any work done after such discovery and until receipt of an Engineer's Instruction or execution of a Change Order shall be at the Contractor's expense.

(b) To avoid any disputes which might arise as to the meaning of any engineering requirements in the Contract Documents or to any alleged error, omission or discrepancy therein, the Engineer's opinion as to the true intent and meaning, and the Engineer's interpretation thereof, shall be first obtained before any legal action is taken. All dimensions shall be taken from numerical figures on the Contract Drawings and no dimensions scaled from such drawings are valid. If dimensions are apparently missing from the Contract Drawings, work shall be suspended on that portion of the construction until the Owner has been notified and has made the necessary dimensions available via an Engineer's Instruction or on a Contract Drawing.

(c) Should any discrepancies or conflicting provisions among the various Contract Documents be discovered, precedence is hereby established in the following order:

1. Change Orders
2. Agreement
3. Addenda
4. Special Conditions
5. General Conditions
6. Engineering Specifications
7. Contract Drawings
8. Construction Schedule
9. Notice to Contractors Inviting Bids
10. Information for Bidders
11. Performance and Payment Bonds
12. Bid Proposal as Accepted.

Section 15: DRAWINGS, SPECIFICATIONS AND INSTRUCTIONS.

(a) The Owner has prepared designs and Contract Documents and may from time to time issue additional information during the term of the Contract, by means of Engineer's Instructions, Construction Drawings or otherwise, to add detail to the Contract Documents. All such Instructions, Drawings and additional information shall be consistent with the Contract Documents and shall be developments thereof.

(b) All construction shall be furnished in accordance with the Contract Documents and to the dimensions fixed thereby. The Owner reserves the right to make reasonable revisions in dimensions and relocations of construction; provided, however, that such revisions or relocations are made prior to construction of any item to be revised or relocated. If such revisions and relocations result in no additional cost to the Contractor, such revisions or relocations shall be made at no additional cost to the Owner.

Section 16: SHOP DRAWINGS.

(a) The Contractor shall prepare or secure, and submit to the Owner for review, not as a check of details but for the purpose of determining whether or not the general method of fabrication, quality of materials and equipment and detailing are in accordance with the Contract Documents, are suitable for instruction of operating personnel and for maintenance, such nonproprietary Shop Drawings as are necessary in the opinion of the Engineer for such purposes. Such Shop Drawings shall include, but not be limited to, general arrangement, outline, connection and external detail drawings and instruction, operation and maintenance booklets. Two reproducible prints and one contact print of each Shop Drawing shall be submitted to the Owner. Four (4) copies of all catalog cuts serving as Shop Drawings shall be submitted to the Owner over and above the number of copies the Contractor wants returned following Owner's review.

(b) The review of Shop Drawings shall not relieve the Contractor of the responsibility which it has under the Contract Documents, including but not limited to quality, quantity, performance characteristics, dimensions, adequate details, schedules and satisfactory coordination of

all materials and equipment components. The Contractor shall submit such Shop Drawings with such promptness as to cause no delay in its own operations or that of its Subcontractors. Shop Drawings shall be checked by the Contractor to determine that they do not deviate from the Contract Documents, and if they do, such Shop Drawings shall be accompanied by a written notice to the Engineer stating in detail the nature of and the reasons for any proposed deviations. Shop Drawings shall be submitted in such sequence as is necessary in the opinion of the Engineer to give them adequate review.

(c) The Engineer's review will be completed within a reasonable time after receipt by the Engineer of each Shop Drawing in proper sequence with markings as follows:

(1) **Reviewed.** Indicates Shop Drawing has been reviewed and appears to conform with the intent of the design concept. The Contractor shall make further distribution of the Shop Drawing and may proceed with fabrication shown on the Shop Drawing.

(2) **Resubmit.** Indicates Shop Drawing or part thereof does not appear to conform with the design concept. The Owner's comments will be noted on the Shop Drawing or in a separate letter. The Contractor shall recheck, make necessary revisions and resubmit for Owner's review.

(3) **Reference.** Indicates Shop Drawing gives information that is incidental to construction described in the Contract Documents and is for general information only.

(d) All Shop Drawings and data shall be concise and legible. Detailed information about the various components involved shall be clearly identified with the component designation. Shop Drawings shall include, as applicable, equipment outlines and dimensions, foundation requirements and wiring diagrams giving complete information for the installation and erection, maintenance and repair, or for identification of parts for ordering replacements on each item to be furnished under the Contract.

(e) The Contractor shall submit to the Owner three (3) sets of final Shop Drawings, showing all changes and revisions and shall furnish one (1) full-size black-on-white positive mylar transparency to the Owner.

Section 17: CONTRACTOR'S COPIES OF DRAWINGS.

The Contractor will be supplied by the Owner without charge, not more than ten (10) sets of Contract Drawings. Additional copies of Contract Drawings, if desired by the Contractor, will be furnished by the Owner at cost. The Contractor shall keep at least one (1) record copy of all Contract Documents, including Plans, Shop Drawings, Modifications, etc., at the construction site in good condition in a weathertight enclosure to show all changes, revisions, and "as-built" notations made during the construction process. These are to be available to the Engineer and shall be delivered to him for the Owner upon completion of the project.

Section 18: MATERIALS AND EQUIPMENT.

(a) Unless otherwise provided in the Special Conditions, the Contractor shall furnish and fully pay for all construction prior to acceptance by the Owner. All materials and equipment incorporated in the completed construction shall be new and not previously used. If requested by the Owner, the Contractor shall provide satisfactory evidence of the kind and quality of materials and equipment to be furnished and that such have been paid for.

(b) If materials or equipment are specified in the Special Conditions to be furnished by the Owner, they shall be conclusively deemed acceptable for the purpose designed if received in satisfactory condition. The Contractor may continue to use such materials or equipment until otherwise directed; provided, however, that if the Contractor discovers any defect in materials or equipment furnished by the Owner, it shall immediately notify the Owner and the Engineer in writing and shall cease to use such defective items pending receipt of written instructions from the Owner or the Engineer.

(c) If materials or equipment are specified in the Special Conditions to be furnished by the Owner, they shall be received by the Contractor f.o.b. the point of delivery specified in the Special Conditions, and in the absence of such specification, receipt by the Contractor shall be f.o.b. the plant of the supplier of the materials or equipment to be so furnished. The Contractor shall receive, load and unload, transport, store and properly protect from damage or loss all such materials or equipment and the Contractor shall be responsible for loss or damage after receipt of materials or equipment and until final acceptance of the construction by the Owner. The Contractor shall immediately report to the Owner and the Engineer in writing in the form and manner prescribed by the Engineer the receipt of Owner-furnished materials and equipment.

Section 19: WORKMANSHIP.

All construction shall be such that its several component parts function as a workable system, with all accessories necessary for its proper operation, and the construction shall be furnished with all components tested, properly adjusted, and in operation. The construction shall be furnished in conformance with the normally accepted standard practice of the trade so as to contribute to maximum efficiency of operation, accessibility and appearance and minimum cost of operation, maintenance and construction of future alterations and additions. It shall also be so furnished that the completed construction will conform and adjust to and operate in a coordinated manner with the existing installation, if any.

Section 20: COMPLIANCE WITH CONTRACT DOCUMENTS.

(a) Unless otherwise provided in the Special Conditions, whenever in the Contract Documents any material, equipment, method or process is indicated or specified without reservation, by patent or proprietary name, by name of the manufacturer or by catalog number, such specification shall be deemed to be used for the purpose of establishing a standard of quality and for facilitating the description of the material, equipment, method or process desired, and shall be deemed to be followed by the words "or equal." In such event the Contractor may offer to furnish another material, equipment, method or process which shall be substantially equal in every

respect to that so indicated or specified. The Engineer shall be the sole judge of the equality of such material, equipment, method or process offered in substitution.

(b) Offers of substitution for items described in the Contract Documents will be considered only upon the written request of the Contractor, and no requests for such substitutions will be acknowledged or considered from suppliers, distributors, manufacturers or subcontractors or any other source. Requests for approval of a substitution shall be by submitting Shop Drawings, where applicable, and shall be accompanied by documentary evidence of equality in the form of descriptive literature, samples, records of performance, certified copies of tests by independent recognized laboratories, and differences in prices and delivery, if any, in the form of certified quotations from suppliers of both the specified material, equipment, method or process and the proposed substitute.

(c) Such offers of substitution of materials or equipment shall include data to substantiate that the "or equal" product meets the following criteria applicable to the item submitted:

(1) The change is adaptable to the design, (2) the functional performance will be equal to or better than the item specified, (3) where the appearance affects the end product, the appearance of the item will be as good as or better than the item specified, (4) the maintenance cost for the product or item will be equal to or less than the item specified, (5) the quality of materials used and the level of construction of the item will be as good or better than the item specified, (6) the net price of the item will be within the same price range as the item specified and (7) installation cost of the item specified will be equal to or less than that of the item specified.

Section 21: VALUE ENGINEERING.

(a) The Contractor may submit alternate construction details for consideration where these will result in reduced project cost without loss of essential function. Such alternates shall be in the form of written value engineering proposals indicating the nature of recommended revisions and the Contractor's proposed credit to the Owner.

(b) A value engineering proposal shall constitute a binding offer by and on the Contractor and may not be withdrawn. However, if not accepted within the time limits described in (c) below, the proposal shall become void. The terms and credits of the proposal may be changed by mutual agreement between the Owner and Contractor, or may be accepted without further modification by the Owner.

(c) The value engineering proposal shall be in sufficient detail to permit a reasonably complete evaluation of the costs and technical changes involved. Proposals shall be addressed to the Owner's Engineer, who shall respond within fourteen (14) calendar days after receipt regarding functional acceptability or completeness of the proposal. In the event no response is made within this time period, the proposal shall be considered rejected. The judgment of the Owner's engineer shall be final regarding acceptability of Contractor's proposal.

(d) If a proposal is accepted, the Contract shall be amended by Change Order to reflect

the modifications and the Contract amount shall be decreased by negotiated or offered credit amount.

Section 22: SOIL AND/OR SUBSURFACE CONDITIONS.

Any data regarding soil and/or subsurface conditions which may be shown in the Construction Drawings, Engineering Specifications, or elsewhere in the Contract Documents, is not to be taken as a representation, but is based on limited information and is at best only an opinion; consequently, such data cannot and shall not be considered precise or complete and there is no guarantee or representation as to its completeness, accuracy, or precision and the Owner shall not be liable therefor. All Bidders and/or Contractors shall thoroughly familiarize themselves with the site and subsurface conditions at all locations on this project by their own independent investigation, including soils or other tests, and the nature of such condition shall be determined and ascertained by Bidders and Contractors on their own by independent investigations and to their own satisfaction.

Section 23: STORAGE OF MATERIALS AND EQUIPMENT.

If any materials or equipment are stored, they shall be stored so as to ensure the preservation of their quality and fitness. Materials and equipment shall be placed on platforms or other hard, clean surfaces, and not on the ground, and shall be placed under cover and heated adequately to prevent condensation or freezing. Stored materials and equipment shall be located so as to facilitate observation. The Contractor shall be responsible for all damage to or loss of the materials or equipment that occurs until written acceptance by the Owner.

Section 24: MANUFACTURER'S INSTRUCTIONS.

All instructions and directions of the manufacturer of material and equipment furnished to the Contractor shall be followed unless specified to the contrary. The Contractor shall obtain and furnish to the Engineer prior to use of materials or installation of equipment five (5) copies of all instructions and directions of the manufacturer of such materials and equipment.

Section 25: DEFECTIVE MATERIALS AND WORKMANSHIP.

(a) The Contractor shall promptly remove from the premises all materials and equipment and correct all construction which in the opinion of the Engineer is defective in workmanship or materials or fails to conform to the Contract, or the manufacturer's specifications or technical data, whether incorporated in the work or not, and the Contractor shall promptly replace and re-execute its own construction in accordance with the Contract and without cost or expense to the Owner, and shall bear the expense of making good all construction of other contractors or the Owner's building or site, destroyed or damaged by such removal and replacement.

(b) If the Contractor does not remove construction which in the opinion of the Engineer is defective or fails to conform to the Contract, within a reasonable time, which shall be fixed by written notice from the Owner, the Owner may remove and store the materials and cause the

correction of such construction at the expense of the Contractor. If the Contractor does not pay the expense of such removal and storage within ten (10) days after delivery of a notice of the cost of such removal and storage, the Owner may give written notice to the Contractor and ten (10) days after such notice the Owner may dispose of the material. Costs arising from such removal, storage or disposal of materials and correction of the construction shall be paid by the Contractor and may be deducted from any payment due the Contractor. The provisions of this section shall not impose any duty or responsibility on the Owner or Engineer to advise or inform Contractor of any materials or work considered to be defective and failure to do so shall not be deemed to be an acceptance of defective materials or work by the Engineer or by the Owner.

(c) All work such as pipes, wires, conduits, insulation and any other items designated by the Engineer shall be inspected prior to the work being covered.

All work requiring inspection that is covered prior to inspection by the Engineer shall be uncovered for inspection as requested by the Engineer and recovered at no cost to the Owner.

Section 26: WARRANTIES.

(a) The Contractor warrants to the Owner that the construction to be provided under the Contract shall be fit for the purpose specified when operated in accordance with generally accepted operating practices; shall be new and free from any defects in material, workmanship, and title; shall meet all specifications, including those relating to performance, contained or incorporated by reference in the Contract; and that the technical direction of installation will be performed in a competent, diligent manner in accordance with generally accepted professional standards.

(b) The foregoing warranties (except as to title) shall apply to defects or deficiencies occurring within a period of one (1) year from final acceptance of the Project by the Owner. If, however, during the above one (1) year warranty period the construction is not available for operation due to a failure to meet such warranties, such time of unavailability shall not be counted as part of the warranty period. The conditions of any field tests shall be mutually agreed upon, and the Contractor shall be notified of and may be represented at all tests that may be made.

(c) If the construction furnished does not meet the warranties specified above, assuming normal and proper use and maintenance, the Owner shall promptly notify the Contractor and make the construction available for correction. The Contractor shall thereupon correct all defects, including nonconformance with the Engineering Specifications, at its expense, either by repairing or replacing any defective or damaged parts of the construction furnished under the Contract. All of the costs of labor, materials and equipment associated with such repair or replacement of the construction, including removal, loading and unloading, transportation to and from the repair site and reinstallation, shall be borne by the Contractor.

(d) Any repaired or replacement construction furnished under the aforesaid warranty shall also carry warranties for one (1) year on the same terms as set forth above from the date of its repair or replacement.

(e) The Contractor shall obtain written warranties from its Subcontractors and suppliers of material and equipment where such warranties are specifically required by the Special

Conditions and shall deliver the original warranties to the Owner.

(f) Neither the final payment, nor any other provision of the Contract, nor partial or entire use of the construction by the Owner shall relieve the Contractor of liability with respect to the warranties referred to in the Contract or any other warranties express or implied.

(g) In the event the Contractor fails to accomplish the warranty work as required herein, the Owner may proceed to accomplish the same and the Contractor, and its Surety, shall be jointly and severally liable to the Owner for all costs and expenses in relation thereto.

Section 27: PATENTS AND ROYALTIES.

(a) The Contractor shall pay the costs of all royalties, permits, licenses or other fees necessary for the performance of the Contract.

(b) The Contractor warrants that the construction furnished hereunder, and any part thereof, shall be delivered free of any rightful claim of any third party for infringement of any patent. If notified promptly in writing and given authority and information, the Contractor shall appear and defend or may settle, at its expense, any suit or proceeding against the Owner so far as it is based on a claimed patent infringement which would result in a breach of this warranty and the Contractor shall pay all damages and costs awarded therein against the Owner due to such breach. In the event the construction or any part thereof is held to constitute such an infringement and the use of said construction or part is enjoined, the Contractor shall, at its expense and option, either procure for the Owner the right to continue using said construction or part, or replace same with non-infringing construction, or part, or modify same so it becomes non-infringing.

(c) The preceding subparagraph shall not apply to any construction or part manufactured to the Owner's design, or to the use of any construction furnished hereunder in conjunction with any other product in a combination not furnished by the Contractor pursuant to the Contract. As to any such construction, part, or use of such combination, the Contractor shall have no liability for patent infringement.

Section 28: LAWS AND REGULATIONS.

(a) The Contractor shall give all notices required by law and comply with all laws, ordinances, rules and regulations relating to the conduct of the construction. The Contractor shall be liable for all violations of the law in connection with construction furnished by the Contractor.

(b) If the Contractor observes that the Contract Documents are at a variance with any law, ordinance, rule or regulation the Contractor shall promptly notify the Owner in writing and all necessary changes shall be made by Engineer's Instructions or Change Order. If the Contractor performs any work knowing or that the Contractor should have known to be contrary to such laws, ordinances, rules and regulations, and without giving such notice to the Owner, the Contractor shall bear all costs of required changes and be liable to the Owner for all damages arising therefrom.

Section 29: PERMITS.

(a) Permits, licenses and easements of a temporary nature which are necessary only for and during the construction, shall be secured and paid for by the Contractor, except those permits, licenses or easements of a temporary nature which are stated in the Special Conditions to be provided by the Owner.

(b) Permits, licenses, and easements of a permanent nature, which are necessary to be maintained after acceptance of construction, shall be secured and paid for by the Owner unless otherwise specified in the Special Conditions.

Section 30: HOLD HARMLESS AND INDEMNITY.

The Contractor specifically obligates itself to the Owner in the following respects, to-wit:

(a) To indemnify and appear and defend and hold harmless the Owner, its elected and appointed officials and employees, from and against any and all claims, damages, losses, costs and expenses, including attorneys' fees and expenses incurred, whether or not suit is filed, and for injuries to or theft of property, including loss of use, injuries to persons, including death, and from any and all other claims, suits or liability, caused in whole or in part by any act or omission of the Contractor, or any of its officers, agents, employees, representatives, servants or subcontractors, or anyone employed by them, or for whose acts Contractor may be liable, in the performance or nonperformance of the work or construction, or of any of the terms and/or conditions of the Contract, or caused by or resulting from any act or omission of Contractor, or any of Contractor's employees, agents, representatives, licensees, contractors or representatives.

(b) To appear, defend, indemnify and hold harmless the Owner and its officers, agents, and employees from and against any and all claims, judgments, liens, loss, damage, cost, charge or expense, including defense costs, court costs and attorneys' fees, whether direct or indirect, by reason of casualties to the construction whether completed or not, including loss of use thereof.

Section 31: INSURANCE.

(a) Contractor shall not commence work under this Contract until all of the insurance required under this section has been obtained and Contractor has filed the certificates of insurance and copies of insurance policies with the Owner as required by the Contract Documents, and the Owner has approved the same, nor shall Contractor allow any subcontractor to commence work on his subcontract until the insurance required has been so obtained.

(b) **General Liability Insurance.**

(1) **Coverage.** The Contractor shall purchase and maintain General Liability Insurance covering bodily injuries, including death at any time resulting therefrom, sustained by any person or persons, and covering damages to property, including loss of use thereof, arising out of or in consequence of the performance of the Contract or the work or construction, whether such

injuries to persons or damages to property are due or are claimed to be due to operations of the Contractor, its subcontractors, or any of their officers, employees, servants, partners, agents or representatives. The Owner shall be named as an additional insured on all such policies.

(2) **Insurance Amounts.** Such General Liability Insurance shall be in the amounts set forth on the form of Certificate of Insurance included in the Contract Documents and required herein to be filed with the Owner.

(3) **Insurance Period.** Such General Liability Insurance shall be maintained in effect at all times until final acceptance by the Owner of all of the completed construction, and products liability and completed operations liability for at least two (2) years thereafter.

(4) **Insurance Form.** Such General Liability Insurance shall indemnify and defend the Contractor, its subcontractors and the Owner, as an additional named insured, and all of their officers, employees, servants, partners, agents and representatives from and against any and all claims, judgments, liens, loss, damage, cost, charge or expense, including defense costs, court costs and attorneys' fees, whether direct or indirect, by reason of liability imposed by law or by contract upon said parties, including Operations/Premises Liability, Independent Contractor's Protective Liability/Owner's Protective Liability, Completed Operations and Products Liability, Broad Form Blanket Contractual Liability, Owner, Non-owned, and Hired Vehicles and Equipment, and Broad Form Property Damage, including explosion, collapse and underground damage and loss of use. Such General Liability Insurance shall be provided on a comprehensive bodily injury and property damage liability form satisfactory to the Owner and shall name the Owner as an additional insured and shall cover and include Contractor's contractual indemnity of Owner. The coverage shall not include an unfunded self-insured retention. A Certificate of Insurance certifying such insurance policies have been issued to the Contractor shall be filed with the Owner in the amount and form and as required herein.

(c) **Worker's Compensation.**

(1) **Insurance Requirements.** The Contractor and its subcontractors shall purchase and maintain industrial accident or worker's compensation insurance issued by an insurance company authorized to write such insurance in the State of Alaska covering bodily injuries, including death at any time resulting therefrom, suffered or alleged to have been suffered by any employee of the Contractor or its subcontractors by reason of or in the course of operations under the Contract.

(2) **Insurance Amount.** The amount and type of such industrial accident or worker's compensation insurance shall be that required by law for all employees employed under the Contract who may come within the protection of such laws, and as required by the Certificate of Insurance required under (e) below.

(3) **Insurance Period.** Such industrial accident and worker's compensation insurance shall be maintained in effect until final acceptance of the completed work and construction.

(4) **Failure to Maintain Worker's Compensation Insurance.** The Contractor acknowledges and agrees that in the event it fails to maintain proper worker's compensation insurance coverage, the State and the Owner may pursue any remedies provided by AS 23.30.045, terminate the Contract without liability, and/or take or pursue any other remedies otherwise provided by law.

(d) **Builder's All Risk.**

(1) **Insurance Requirement.** Contractor shall purchase and maintain All Risk Builder's Risk (course of construction) insurance covering any and all loss, casualty or otherwise, of all or any part of the work or construction, and all work and materials in place and materials stored at the building site and at remote storage sites, which insurance shall include, but not be limited to, loss by fire, earthquake, landslide or flood damage. The Contractor and the Owner shall each be named as insured as their interests may appear and each shall be named in the policy or policies as insureds and the deductible shall not exceed ten percent (10%) of the total amount of insurance that is required in (2) below without prior approval of the Owner. Contractor shall furnish coverage at all times for the full replacement value of all completed work and construction, including approved Change Orders, as well as materials in place and/or stored at the site, whether or not partial payment has been paid by the Owner. The Contractor shall maintain this insurance until all of the work and construction under the Contract has been fully completed and finally accepted by the Owner. Contractor shall submit to the Owner a complete copy of the All Risk Builder's Risk (course of construction) insurance policy hereinabove required.

(2) **Insurance Amount.** Such All Risk Builder's Risk insurance shall be equal to the Total Contract Amount.

(3) **Insurance Period.** Such Builder's All Risk insurance shall be maintained in effect until final acceptance of all of the completed work, construction and the Project.

(e) **Certificates of Insurance.** Contractor shall deposit with the Owner not later than submittal of the signed Agreement and required bonds, Certificates of Insurance from its insurance companies certifying to the coverage of all of the insurance required in this section in the form, and in the amounts set forth on the form of Certificate of Insurance set forth in the Contract Documents, and as required herein, and shall furnish copies of all insurance policies at any time upon request of the Owner.

(f) **Cancellation of Insurance.**

(1) The Contractor shall not cause any insurance policy to be canceled or permit any policy to lapse or reduce the amount of such insurance during the period of the Contract. All insurance policies shall include a provision to the effect that the insurance policy shall not be subject to cancellation, lapse, or to a reduction in the amount of insurance until written notice has been first delivered to the Owner by the insuring company stating the date that such cancellation, lapse, or reduction shall be effective, which date shall not be less than thirty (30) days after the delivery of such notice to the Owner.

(2) When a renewal of the policy is approaching, Contractor shall deposit evidence of renewal not less than twenty (20) days before expiration of the term of the policy.

(3) The Owner shall have the right to require Contractor provide verification, including the right to inspect Contractor's records at reasonable times, to confirm the insurance called for herein is in force. If the Contractor fails to provide verification of full coverage of all the insurance required by the Contract Documents, at all times, Owner may, without liability, direct the Contractor cease any further operations, and remove all personnel and equipment from the project site until all such insurance is verified as being in full force and effect, or may, without liability, deem such failure to verify full coverage as a material breach and default and terminate the Contract without liability.

(g) **Waiver of Subrogation.** Each of the policies of insurance required herein shall contain a clause or endorsement pursuant to which the insurance companies waive subrogation or consent to a waiver of right to recovery against the Owner.

(h) **Insurance Companies.** Unless such requirement is waived by the Owner in writing, all insurance companies issuing any insurance required in this section shall be member insurers included and covered under the Alaska Insurance Guarantee Association Act (Alaska Statutes, Section 21.80.010, et seq.).

Section 32: WAGE RATES.

(a) Contractor shall pay not less than the minimum wage per hour for each classification of laborers, workers, or mechanics as set forth in the State of Alaska, Department of Labor, Wage and Hour Division, pamphlet entitled "Laborers' and Mechanics' Minimum Rates of Pay," a copy of which is included as part of these Contract Documents, and in the event the rates are amended at any time during the period of this Contract, Contractor shall adjust the rates paid in such manner as to at all times be not less than the then current prevailing wage rate schedule issued by the State of Alaska. Contractor shall in addition thereto comply with all other applicable provisions of Alaska Statutes, Title 36, Chapter 5 [Wages and Hours of Labor]. Contractor further expressly acknowledges and agrees that prior to bidding on this Contract and the Project, and at the time of submitting its bid and entering into the Contract, it has obtained and fully informed itself of the current wage rate schedule and Contractor by entering into this Contract, assumes full and sole responsibility to keep itself fully informed as to any changes made in the current wage scale required to be paid and will adjust and pay the prevailing wage rates, as such are modified from time to time, at all times during the performance of the Contract.

(b) The Contractor shall submit to the State of Alaska, Department of Labor, a certified payroll on a form suitable to the Department of Labor each week as required by law, with copies thereof to the Owner if requested, and submit to the Owner an executed Minimum Wage Affidavit with each pay request and at the end of the project. The affidavit shall be in the form included in the Contract documents.

(c) Contractor agrees:

(1) that the Contractor, and his subcontractors, shall pay all employees unconditionally and not less than once a week;

(2) that wages shall not be less than those stated in the most current Minimum Wage Schedule published by the State Department of Labor regardless of the contractual relationship between the Contractor or subcontractors and laborers, mechanics, or field surveyors;

(3) that the scale of wages to be paid shall be posted by the Contractor in a prominent and easily accessible place at the site of the work;

(4) that the Owner is authorized to withhold so much of the accrued payments as is necessary to pay to laborers, mechanics, or field surveyors employed by the Contractor or subcontractors the difference between:

(a) the rates of wages required by the Contract to be paid laborers, mechanics, or field surveyors on the work, and

(b) the rates of wages in fact received by laborers, mechanics or field surveyors.

(d) 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 of wages less than the rate of wages required by the Contract to be paid, the Owner may, by written notice to the Contractor, terminate the Contractor's right to proceed with the work or the part of the work for which there is a failure to pay the required wages and to prosecute the work to completion by contract or otherwise, and the Contractor and his sureties shall be liable to the Owner for all costs and expense incurred thereby and for any excess costs in completing the work. (AS 36.05.070).

Section 33: AFFIRMATIVE ACTION.

(a) Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex or national origin. Contractor will take affirmative action to ensure the applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this subsection.

(b) Contractor will, in all solicitations or advertisements for employees placed by or on behalf of Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex or national origin.

(c) Contractor will send to each labor union or representative of workers and with which it has a collective-bargaining agreement or other contract or understanding, a notice advising the said labor union or worker's representative of Contractor commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(d) Contractor will comply with all provisions of Executive Order No. 11246 of September 24, 1965, as amended by Executive Order No. 11375 of October 13, 1967, and the rules, regulations and relevant orders of the Secretary of Labor.

e) Contractor will furnish all information and reports required by Executive Order No. 11246 of September 24, 1965, as amended, and by the rules, regulations and orders of the Secretary of Labor, or pursuant thereto, and will permit access to its books, records and accounts by the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations and orders.

(f) The Contractor will include the provisions paragraphs (a) through (e) of this section in every contract, and will require the inclusion of these provisions in every subcontract entered into by any of its subcontractors, so that such provisions will be binding upon each Subcontractor, as the case may be. For the purpose of including such provisions in any construction, maintenance, or service contract or subcontract, as required hereby, the term "Contractor" and the term "Subcontractor" may be changed to reflect appropriately the name or designation of the parties of such contract or subcontract.

(g) The Contractor agrees that he will fully cooperate with the office or agency of the State of Alaska which seeks to deal with the problem of unlawful or invidious discrimination, and with all other State efforts to guarantee fair employment practices under this Contract, and said Contractor will comply promptly with all requests and directions from the State Commission of Human Rights or any of its officers or against relating to prevention of discriminatory employment practice.

(h) Full cooperation as expressed in the foregoing clause (g) shall include, but not be limited to, being a witness in any proceeding involving questions of unlawful or invidious discrimination if such is deemed necessary by any official or agency of the State of Alaska, permitting employees of said Contractor to be witnesses or complainants in any proceeding involving questions of unlawful or invidious discrimination, if such is deemed necessary by any official or agency of the State of Alaska, or the Owner, participating in meetings, submitting periodic reports on the equal employment aspects of present and future employment, assisting in inspection of relevant facilities, and promptly complying with all State directives deemed essential by any office or agency of the State of Alaska, or the Owner, to insure compliance with all Federal and State laws, regulations, and policies pertaining to the prevention of discriminatory employment practices.

(i) Failure to perform any of the above agreements pertaining to equal employment opportunities shall be deemed a material breach of the Contract and sufficient grounds for termination thereof for cause.

Section 34: EMPLOYMENT OF LOCAL RESIDENTS.

Contractor shall, to the extent required by law, comply with the employment preference provisions of Alaska Statutes 36.10.010 et seq.

Section 35: NOTICE TO PROCEED.

Within ten (10) days after submittal by the Contractor of all required documents, and the execution of the Contract by the Owner, written Notice to Proceed will be given by the Owner to the Contractor. Unless otherwise specified in the Notice to Proceed, the Contractor shall begin construction immediately upon receipt of the Notice to Proceed and shall continue regularly thereafter, unless otherwise directed in writing by the Owner, with such work force, materials and equipment as to assure construction progress in accordance with the construction schedule, if any, and that construction is complete within the construction time stated in the Contract Documents.

Section 36: TIME.

All times and time limits stated in the Contract Documents shall be of the essence of the Contract. All references to days shall mean calendar days and the time within which acts are to be done shall be computed by excluding the first and including the last day, and if the last day is a Sunday or legal holiday where the act is to be performed, the act shall be completed on the next business day.

Section 37: CONSTRUCTION TIME.

The Contractor agrees to achieve Substantial Completion as called for in the Contract within the number of days, or by the date specified, for completion of Construction set forth in the Agreement, or in the event that the time for completion is extended by Change Order as provided herein, then within the additional days by which the time is so extended. All changes in Construction Time shall be made only by Change Orders to the Contract. Contractor further agrees to complete the work so that it is ready for final payment in accordance with Section 48.

Section 38: CONSTRUCTION SCHEDULE.

(a) A Construction Schedule, if required, shall be as required by the Special Conditions or Division 1 in the form of either a time bar diagram showing certain of the various operations necessary to complete the construction, including the starting and completion date of each operation shown, or the Construction Schedule shall be prepared by the critical path method and shall set forth a network analysis, which shall consist of an arrow diagram, tabulation of activities, estimated time and starting and completion date of each activity and an indication of the critical path.

(b) In the event progress payments are provided for and authorized in the Special Conditions, the Contractor's Requests for Payment will be considered and payments will be approved by the Owner on the basis of the Contractor's actual progress in relation to the dates shown in the Construction Schedule for completion of various parts of the operations. If the

actual progress fails to meet the Construction Schedule, the Contractor shall increase its work force and equipment at its own expense as required to bring the actual progress of the operations into conformance with the Construction Schedule.

(c) During the course of construction the Contractor shall enter on the Construction Schedule its estimate of progress at the end of each calendar month, or at such more frequent intervals as directed by the Engineer, and shall deliver to the Owner two (2) copies thereof with each submittal of the Contractor's Request for Payment.

Section 39: CHANGES IN CONSTRUCTION.

(a) If the Contractor claims that the Engineer's Instructions or additional requirements of the Owner, by drawings or otherwise, entitle the Contractor to additional payment or extension of time under the Contract, or both, the Contractor shall deliver to the Owner a written proposal of changes in Total Contract Amount and Construction Time within ten (10) days after the receipt of such instructions or requirements and before proceeding to execute the changes. Failure of the Contractor to deliver such a proposal shall constitute a waiver by the Contractor of any claim for additional payment or extension of time. If the Owner and the Contractor are in agreement as to changes in Total Contract Amount and Construction Time, a Change Order to the Contract will be issued for approval and execution by the Owner and Contractor.

(b) By proper action of its governing body and without invalidating the Contract, the Owner may order changes in the Contract Documents requiring changes in the construction, order changes in the quantities of the unit price items or make other changes in the Contract provided such changes are within the general scope of the Contract. No official, employee, agent or representative of the Owner, with the exception of the governing body empowered to accept and authorize execution of the Contract, shall have power to authorize any change in the Contract. It shall be the responsibility of the Contractor, before proceeding with any change, except a change which is an emergency in the opinion of the Owner, to determine that the execution of a Change Order has been properly authorized on behalf of the Owner by its governing body.

(c) When a change in construction is ordered by the Owner, a Change Order shall be executed by the Owner and the Contractor; except that the Contractor hereby agrees that changes in the construction for which the Special Conditions or other provisions of the Contract provides that the Contractor is to be reimbursed on the basis of cost plus certain allowances may be made by the Owner, and the Contractor hereby accepts such Change Orders.

(d) When a change in quantities is ordered by the Owner, a Change Order shall be executed by the Owner and the Contractor; except that the Contractor hereby agrees to (1) increases of quantities of unit price items of basic units of construction not exceeding twenty-five percent (25%) of the bid quantities unless otherwise specified in the Special Conditions, (2) increases in quantities of unit price items of integrated units of construction in the aggregate not exceeding twenty-five percent (25%) of the Total Contract Amount, (3) changes in work or quantities for which the Contract provides that the Contractor is to be reimbursed on the basis of cost plus certain allowances, and (4) reductions of quantities of unit price items of basic or

integrated units of construction of any amount may be made by the Owner, and the Contractor hereby accepts such Change Orders.

(e) The Contractor shall notify the Engineer in advance of the exact time of commencing any change in the construction or change in quantities where payment is on the basis of cost plus certain allowances and shall keep the Engineer fully informed at all times of the progress of said change and the materials, equipment, and labor involved. The Contractor shall submit to the Engineer a written report of the progress and costs incident to such change on the day following the day during which said change was being carried on. Failure to do so shall constitute a waiver of any and all claims for additional compensation for such changes by the Contractor.

Section 40: EXTENSION OF TIME.

(a) Should the completion of the construction required under the Contract be delayed beyond the time herein specified for completion, the Owner may grant the Contractor additional time for completion by executing a Change Order modifying the Construction Time and Construction Schedule. If the failure of the Contractor to complete the construction within said specified time results from unavoidable delay as hereinafter defined, the Construction Time shall be extended by the number of days lost as a result of the unavoidable delay, provided, however, that the Contractor shall make a claim to the Owner in writing for such extension of time as herein provided. In considering applications for extension of time, the Engineer will classify delays according to the following definitions:

(1) Unavoidable delays in the prosecution or completion of the construction shall include all delays which result from causes beyond the control of the Contractor and which could not have been avoided by the exercise of reasonable care, prudence, foresight and diligence on the part of the Contractor or its Subcontractors. Delay in completion due to contract modifications ordered by the Owner, unforeseeable delays in the completion of the construction of other contractors employed by the Owner, floods, fire, labor strikes, war, the public enemy and Acts of God will be considered unavoidable delays, insofar as they necessarily interfere with the Contractor's completion of the construction. DELAY DUE TO ADVERSE WEATHER CONDITIONS, WILL NOT BE REGARDED AS UNAVOIDABLE DELAYS AS THE CONTRACTOR MUST PLAN ITS CONSTRUCTION WITH PRUDENT ALLOWANCE FOR SUCH CONDITIONS AND IN PARTICULAR, AS SUCH CONDITIONS EXIST IN KETCHIKAN, ALASKA, AND ENVIRONS.

(2) Avoidable delays in the prosecution or completion of the construction shall include all delays which in the opinion of the Engineer could have been avoided by the exercise of care, prudence, foresight and diligence on the part of the Contractor or its Subcontractors. Delays in the prosecution of parts of the construction which may in themselves be unavoidable but do not necessarily prevent or delay the prosecution of other parts of the construction nor the completion of the whole construction within the time herein specified; reasonable loss of time resulting from the necessity of submitting Shop Drawings to the Owner for review and from the making of surveys, measurements, and observations; and such interruptions as may occur in the prosecution of the work on account of the reasonable interference of other contractors employed by the Owner which do not necessarily prevent the completion of the whole construction within

the time agreed upon and delays due to adverse weather conditions, shall constitute avoidable delays within the meaning of the Contract.

(b) Claims for extension of time shall be made in writing to the Owner no later than five (5) days after occurrence of the event causing the delay. In the event of continuing cause of delay, only one (1) claim shall be necessary. Contractor agrees that failure to make such claim within the time specified shall constitute a binding waiver of such claim.

(c) No claim for delay shall be allowed on account of failure to furnish Construction Drawings until ten (10) days after written request for such drawings has been made by the Contractor to the Owner. There may be some Construction Drawings which cannot be made until certain work has been done by the Contractor. Request for such Construction Drawings shall not be effective, so as to start the running of the ten (10) day period, until the Contractor's work has advanced to the point which will enable and require such Construction Drawings to be made.

Section 41: OWNER'S USE OF CONSTRUCTION.

(a) The Owner shall have the right to take possession of, use and collect revenues from any completed, partially completed, satisfactory or unsatisfactory portions of the construction after the time for completion of the entire construction has expired, but such taking possession and use shall not be deemed an acceptance of any construction not completed in accordance with the Contract Documents.

(b) The Contractor shall not be entitled to any extra compensation for or extension of time due to costs to the Contractor arising from the use of any portion of the construction by the Owner.

Section 42: PAYMENT OF THE CONTRACT AMOUNT.

(a) The Owner hereby agrees to pay to the Contractor as full compensation for the timely, proper and complete performance of the Contract a sum of money as follows:

(1) **Total of Lump Sum Prices.** If the Total Contract Amount is a lump sum price, or the total of lump sum prices, such amounts; or

(2) **Total of Unit Prices.** If the Total Contract Amount is computed from the actual measured quantities in the completed construction at the unit prices for construction listed in the Bid Schedule of the Contractor's Bid Proposal, such amounts; or

(3) **Total of Lump Sum Plus Unit Prices.** If the Total Contract Amount is a combination of (1) and (2) above, the total of such amounts;

provided, said sum of money is further properly adjusted in accordance with the applicable provisions of the Contract.

(b) The making of any payment to the Contractor under the Contract shall not relieve the Contractor of any obligations thereunder. The Contractor is obligated to complete the Contract

in its entirety and to deliver to the Owner such completed construction as is specified in the Contract. The Contractor shall be obligated to repair, replace, restore, or rebuild any fully or partially completed construction required to be provided under the Contract until the Contract is fully performed and the Owner gives final acceptance in writing of the work, except that the Contractor's warranty and bonds shall remain in force for the period provided herein and the Contract Documents.

Section 43: PAYMENT FOR CHANGES.

(a) Payment for increases of quantities of unit price items of integrated units of construction which in the aggregate do not exceed twenty-five (25%) percent of the Total Contract Amount, and for increases of quantities of unit price items of basic units of construction which do not exceed twenty-five (25%) percent of the bid quantities, and for all quantities of basic and integrated units of construction less than the bid quantities, unless otherwise specified in the Special Conditions, shall be made at the unit prices in the Bid Schedule in the Contractor's Bid Proposal.

(b) Payment for all changes in lump sum items and for that part of the changes in quantities which are increases of quantities of unit price items in excess of twenty-five percent (25%) of the bid quantities for basic units of construction or in excess of twenty-five percent (25%) of the Total Contract Amount for integrated units of construction shall, at the option of the Owner, be determined in one of the following ways:

- (1) by Contractor's proposal and Owner's acceptance of reasonable unit prices, or
- (2) by Contractor's proposal and Owner's acceptance of reasonable lump sum prices, or
- (3) by payment to the Contractor on a cost basis plus certain allowances as follows:

<u>Items for which payment will be made on a cost plus basis</u>	<u>Percentage Allowance for Overhead and profit in addition to net costs</u>
Labor	20%
Materials and equipment	10%
Use of Equipment	15%

The net costs of items for which payment shall be made on a cost plus basis shall be computed as follows:

(a) **Labor.** For all labor, including such foreman supervision as may be necessary, the Contractor shall be paid the payroll cost of such labor and supervision, but not exceeding the current prevailing rates of wages in the locality where the work is performed, applicable health and welfare benefits, social security, unemployment compensation, and other occupational taxes, for each hour that labor and foreman supervision are actually engaged upon such construction, plus that portion of the cost prorated on the basis of time worked, of travel time, subsistence, and

other labor benefits which are an obligation of the Contractor under the contractor-union labor agreement, if any, applicable to the Project.

(b) **Materials and Equipment.** For all materials and equipment incorporated in the completed construction, the Contractor shall be paid its actual invoice cost, including actual freight and express charges, less all offered or available discounts, regardless of whether or not they may have been taken.

The Contractor shall furnish as evidence of all charges for materials and equipment, valid copies of vendor's invoices, including freight and express bills. For such materials as may be furnished from the Contractor's stocks for which an invoice is not available, the Contractor shall furnish an affidavit certifying to its actual cost of such materials.

In the event that the Contractor's cost of such materials and equipment furnished is excessive in the opinion of the Engineer, or if the Contractor does not furnish satisfactory evidence of its costs, the Owner reserves the right to establish the cost of all or a part of such materials delivered to the location of the Project at the lowest current wholesale prices less all applicable discounts at which said materials and equipment are available to the Contractor in the quantities required.

The Owner reserves the right to furnish such materials and equipment as it deems advisable, and the Contractor shall receive no payment for costs or allowances on such materials.

(c) **Use of Equipment.**

(1) **Contractor-Owned Equipment.** For Contractor-owned equipment, including machine-power tools, which is necessary or desirable for the construction in the opinion of the Engineer, the Contractor shall receive the rental rates in the current edition and appropriate volume of the "Rental Rate Blue Book for Construction Equipment" published by Dataquest, Inc., 1980 Ridder Park Drive, San Jose, California 95131, (hereinafter referred to as "Blue Book") and as modified by the Special Conditions, for the time that said equipment is in use on such construction, excluding therefrom all time that such equipment is inoperative because of malfunction or breakdown. Such rates shall be the monthly, weekly, daily or hourly rates applicable to the total period the equipment is in use on the project, whichever is lowest and results in the least total amount.

For equipment not listed in the Blue Book, the contractor shall receive a rental rate as agreed upon before such work is begun. If agreement cannot be reached, the Craig City School District reserves the right to establish a rate based on similar equipment in the Blue Book on prevailing commercial rates in the area.

When Contractor-owned equipment is ordered by the Owner to be held at standby, the equipment rental will be paid at one-half (1/2) of the said rate; except, no percentage allowance shall be paid for equipment on ordered standby.

The said equipment rental rates are the maximum rates allowable for equipment of

modern design in good working condition and shall include and be full compensation for depreciation, investment costs, and furnishing all fuel, oil, lubrication, repairs, maintenance, insurance and incidental expenses, and all other costs except labor for operation thereof. Individual pieces of equipment having a purchase price of Six Hundred Dollars (\$600.00) or less will be considered to be tools or small equipment, and no rental will be allowed on such tools or small equipment.

In the event the equipment is not at the Project site and the Engineer determines that such equipment would not have been required other than for the changed construction, and it is necessary to obtain such equipment exclusively for such changed construction, the actual costs of moving such equipment to and from the Project site will be paid to the Contractor from the nearest point such equipment is available, plus rental time during movement of the equipment at fifty percent (50%) of said rental rates.

(2) **Equipment Furnished by Others.** If Contractor-owned equipment is not available and equipment is rented from outside sources, payment will be made on the basis of actual invoice cost, except that when the equipment is ordered standby no percentage allowances will be made. Use of non-owned equipment at rates higher than those established by the "Rental Rate Blue Book for Construction Equipment," and as modified by the Special Conditions will not be allowed, except upon prior written approval of the Owner.

(d) **Payment in Full.** The compensation as herein provided, including the percentage allowance, shall be payment in full for all construction furnished hereunder and all expenses of every nature, kind and description, including, but not limited to, social security, unemployment compensation, occupational taxes and any other federal, state or local taxes, premiums on public liability and property damage insurance, use of small tools and equipment for which no separate payment is allowed, overhead expense and profit.

When construction is furnished by a Subcontractor to the Contractor, the percentage allowances shall be allowed only on the costs to the Subcontractors of labor, material and use of equipment.

The Contractor's cost records pertaining to work paid for hereunder shall be open to inspection and audit by representatives of the Owner during the period of the Contract and for not less than one (1) year after the acceptance of all construction. Where payment for labor, materials or use of equipment is based on the cost thereof to a Subcontractor or material supplier to the Contractor, the Contractor expressly warrants that the cost records of such Subcontractor or material supplier shall be open to inspection and audit by representatives of the Owner on the same terms and conditions as the cost records of the Contractor. If an audit is to be started more than sixty (60) days after the acceptance of all construction under the Contract, the Contractor will be given reasonable notice of the time when such audit is to begin.

(e) **List of Construction Equipment.** Within fifteen (15) days after Notice to Proceed, the Contractor shall furnish to the Engineer a list of construction equipment to be used in the Construction together with applicable Blue Book rental rates. For construction equipment for which Blue Book rental rates are not available, the Contractor shall provide its fully documented and

established rental rates for such equipment under similar usage. Such rental rates shall become effective when approved by the Engineer. The Contractor shall furnish copies of fuel, oil, lubrication and normal maintenance of construction equipment applicable to the project location.

Section 44: PAYMENT FOR UNCORRECTED CONSTRUCTION.

If, in the opinion of the Engineer, it is inexpedient, impractical or otherwise not in the best interests of the Owner, to correct construction which has been damaged, which is faulty, or which has not been furnished in accordance with the Contract, the Owner shall have the right in its sole discretion, to accept such work and an equitable reduction in the Total Contract Amount shall be made.

Section 45: PROGRESS PAYMENTS.

(a) Partial payments of the Total Contract Amount, if such progress payments are to be allowed or made, will be made as specified in the Special Conditions. No progress payment will be allowed unless provided for in the Special Conditions.

(b) In the event progress payments are provided for in the Special Conditions, the Contractor may, unless otherwise provided in the Special Conditions, submit to the Engineer, not later than the tenth (10th) day of each calendar month, two (2) copies of a Contractor's Request for Payment for construction completed during the previous calendar month. Such Contractor's Request for Payment shall be in the form provided in the Special Conditions. With each Contractor's Request for Payment, the Contractor shall, if required, submit satisfactory evidence of payment for materials and labor, including payments to Subcontractors, made during the previous month. Each Contractor's Request for Payment shall be computed from construction completed on all items listed in the Bid Proposal less the amounts retained as provided in the Special Conditions or elsewhere in the Contract Documents, including any claims or offsets asserted against the Contractor, including any asserted by the Owner, and less all previously approved Contractor's Requests for Payment. Partial payment may be made for partially completed construction to the extent completed in the opinion of the Engineer.

(c) Partial payments on account of changes in construction may be made periodically in the same manner as partial payments on the Total Contract Amount.

(d) Within fifteen (15) days after proper submission of Contractor's Request for Payment by the Contractor, the Engineer will:

(1) recommend approval of the Contractor's Request for Payment submitted, or

(2) recommend approval of such other amount, if any, as is due the Contractor, in the opinion of the Engineer, informing the Contractor of the amount recommended, if any.

(e) The recommended Contractor's Request for Payment will be submitted to the Owner by the Engineer, and the Owner may authorize a partial payment to the Contractor, on the basis of the recommended Contractor's Request for Payment, but the Owner will withhold a retained

amount as specified in the Special Conditions and such other amounts as are recommended by the Engineer or allowed to be retained by the Owner, including any claims or offsets asserted against the Contractor.

Section 46: PAYMENTS WITHHELD.

(a) In addition to the amount retained as otherwise provided in the Contract Documents, the Owner may withhold such amounts from any payment as may be necessary in the opinion of the Engineer or Owner for protection from loss on account of

- (1) defective work not remedied;
- (2) claims filed or reasonable evidence indicating probable filing of claims;
- (3) failure of the Contractor to make proper and full payments promptly to its own employees or to the Subcontractors for materials or labor within a reasonable time after the Contractor has received the material or labor for incorporation into the construction;
- (4) a reasonable doubt that the Contract can be completed by another contractor for the balance then unpaid;
- (5) damage to the Owner, its buildings, structures, or property, to another contractor or subcontractor, or any other person, caused or contributed to by the Contractor, its officers, employees, agents, representatives, subcontractors, or persons for whom Contractor is responsible;
- (6) bankruptcy, receivership or insolvency of, or the pendency of such proceedings against the Contractor;
- (7) costs of the Owner for engineering tests, inspection costs, or other work, costs or expenses, to be reimbursed to the Owner by the Contractor as provided in the Contract Documents;
- (8) unsatisfactory prosecution of the work, or failure of the Contractor to complete any part of the construction in accordance with the Construction Schedule or the Contract;
- (9) credits refused by the Contractor for construction deleted; or
- (10) errors in previous partial payments, or claims by the Owner against the Contractor.

Section 47: TERMINATION FOR CONVENIENCE.

(a) The performance of work under this Contract may be terminated by the Owner in accordance with this clause in whole, or from time to time in part, whenever the Owner shall determine that such termination is in the best interest of the Owner. Any such termination shall

be effected by delivery to the Contractor of a Notice of Termination specifying the extent to which performance of work under the Contract is terminated, and the date upon which such termination becomes effective.

(b) After receipt of a Notice of Termination, and except as otherwise directed by the Owner, the Contractor shall:

(1) Stop work under the Contract on the date and to the extent specified in the Notice of Termination;

(2) Place no further orders or subcontracts for materials, services, or facilities except as may be necessary for completion of such portion of the work under the Contract as is not terminated;

(3) Terminate all orders and subcontracts to the extent that they relate to the performance of work terminated by the Notice of Termination;

(4) Assign to the Owner, in the manner, at the times, and to the extent directed by the Owner, all of the right, title, and interest of the Contractor under the orders and subcontracts so terminated. In which case the Owner shall have the right, in its discretion, to settle or pay any or all claims arising out of the termination of such orders and subcontracts;

(5) Settle in good faith all outstanding liabilities and all claims arising out of such termination of orders and subcontracts, with the approval or ratification of the Owner to the extent Owner may require, which approval or ratification shall be final for all the purposes of this clause;

(6) Transfer title to the Owner, and deliver in the manner, at the times, and to the extent, if any, directed by the Owner, (i) the fabricated or unfabricated parts, work in process, completed work, supplies, and other material produced as a part of, or acquired in connection with the performance of, the work terminated by the Notice of Termination, and (ii) the completed or partially completed plans, drawings, information, and other property which, if the Contract had been completed, would have been required to be furnished to the Owner;

(7) Use his best efforts to sell, in the manner, at the times, to the extent, and at the price or prices directed or authorized by the Owner, any property of the types referred to in (6) above: Provided, however, that the Contractor (i) shall not be required to extend credit to any purchaser, and (ii) may acquire any such property under the conditions prescribed and at a price or prices approved by the Owner; and provided further, that the proceeds of any such transfer of disposition shall be applied in reduction of any payments to be made by the Owner to the Contractor under this Contract or shall otherwise be credited to the price or cost of the work covered by this Contract or paid in such other manner as the Owner may direct;

(8) Complete performance of such part of the work as shall not have been terminated by the Notice of Termination; and

(9) Take such action as may be necessary, or as the Owner may direct, for the protection and preservation of the property related to this Contract which is in the possession of the Contractor and in which the Owner has or may acquire an interest.

(c) After receipt of a Notice of Termination, the Contractor shall submit to the Owner his termination claim, in the form and with the certification prescribed by the Owner. Such claim shall be submitted promptly but in no event later than sixty (60) days from the effective date of termination, unless one or more extensions in writing are granted by the Owner upon request of the Contractor made in writing within such sixty (60) day period or authorized extension thereof. However, if the Owner determines that the facts justify such action, he may receive and act upon any such termination claim at any time after such one-year period or extension thereof. Upon failure of the Contractor to submit his termination claim within the time allowed, the Owner may determine, on the basis of information available to the Owner, the amount, if any, due to the Contractor by reason of the termination and shall thereupon pay to the Contractor the amount so determined.

(d) Subject to the provisions of paragraph (c), the Contractor and the Owner may agree upon the whole or any part of the amount or amounts to be paid to the Contractor by reason of the total or partial termination of work pursuant to this clause, which amount or amounts may include a reasonable allowance for profit on work done: Provided, that such agreed amount or amounts, exclusive of settlement costs, shall not exceed the total contract price as reduced by the amount of payments otherwise made and as further reduced by the contract price of work not terminated, and any claims or offsets against the Contractor pursuant to the Contract, or otherwise, by the Owner or other persons. The Contract shall be amended accordingly, and the Contractor shall be paid the agreed amount. Nothing in paragraph (e) of this clause, prescribing the amount to be paid to the Contractor in the event of failure of the Contractor and the Owner to agree upon the whole amount to be paid to the Contractor by reason of the termination of work pursuant to this section, shall be deemed to limit, restrict, or otherwise determine or affect the amount or amounts which may be agreed upon to be paid to the Contractor pursuant to paragraph (d).

(e) In the event of the failure of the Contractor and the Owner to agree as provided in paragraph (d) upon the whole amount to be paid to the Contractor by reason of the termination of work pursuant to this section, the Owner shall determine, on the basis of information available to it, the amount, if any, due to the Contractor by reason of the termination and shall pay to the Contractor the amounts determined as follows:

(1) With respect to all contract work performed prior to the effective date of the Notice of Termination, the total (without duplication of any items) of:

- (i) The cost of such work;
- (ii) The cost of settling and paying claims arising out of the termination of work under subcontracts or orders as provided in paragraph (b)(5) above, exclusive of the amounts paid or payable on account of supplies or materials delivered or services furnished by the Subcontractor prior to the effective date of the Notice of

Termination of work under this Contract, which amounts shall be included in the cost on account of which payment is made under (i) above; and

- (iii) A sum, as profit on (i) above, determined by the Owner to be fair and reasonable: Provided, however, that if it appears that the Contractor would have sustained a loss on the entire Contract had it been completed, no profit shall be included or allowed under this subdivision (iii) and appropriate adjustment shall be made reducing the amount of the settlement to reflect the indicated rate of loss; and

(2) The reasonable cost of the preservation and protection of property incurred pursuant to paragraph (b)(9); and any other reasonable cost incidental to termination of work under this contract, including expense incidental to the determination of the amount due to the Contractor as the result of the termination of work under this contract.

The total sum to be paid to the Contractor under (1) above shall not exceed the total contract price as reduced by the amount of payments otherwise made and as further reduced by the contract price of work not terminated, and any claims or offsets by the Owner. Except for normal spoilage, and except to the extent that the Owner shall have otherwise expressly assumed the risk of loss, there shall be excluded from the amounts payable to the Contractor under (1) above, the fair value, as determined by the Owner, of property which is destroyed, lost, stolen, or damaged so as to become undeliverable to the Owner, or to a buyer pursuant to paragraph (b)(7).

(f) The Contractor shall have the right to dispute under Section 71 [Remedies] from any determination made by the Owner under paragraphs (c) or (e) above, except that, if the Contractor has failed to submit his claim within the time provided in paragraph (c) above and has failed to request extension of such time, he shall have no such right of appeal. In any case where the Owner has made a determination of the amount due under paragraphs (c) or (e) above, the Owner shall pay to the Contractor the following: (1) if there is no right of appeal hereunder or if no timely appeal has been taken, the amount so determined by the Owner or (2) if a proceeding is initiated under Section 71 [Remedies], the amount finally determined in such proceeding.

(g) In arriving at the amount due the Contractor under this clause there shall be deducted (1) all unliquidated advance or other payments on account theretofore made to the Contractor, applicable to the terminated portion of this contract, (2) any claim which the Owner may have against the Contractor in connection with this contract, and (3) the agreed price for, or the proceeds of sale of any materials, supplies, or other things kept by the Contractor or sold, pursuant to the provisions of this clause, and not otherwise recovered by or credited to the Owner.

(h) If the termination hereunder be partial, prior to the settlement of the terminated portion of this contract, the Contractor may file with the Owner a request in writing for an equitable adjustment of the price or prices specified in the Contract relating to the continued portion of the Contract (the portion not terminated by the Notice of Termination), and such equitable adjustment as may be agreed upon shall be made in such price or prices; however, nothing contained herein shall limit the right of the Owner and the Contractor to agree upon the amount or amounts to be

paid to the Contractor for the completion of the continued portion of the Contract when said Contract does not contain an established contract price for such continued portion.

Section 48: ACCEPTANCE AND FINAL PAYMENT.

(a) When the Contractor has completed the construction in accordance with the terms of the Contract Documents and all construction has operated satisfactorily for not less than fifteen (15) days after completion, the Contractor shall submit to the Engineer a Contractor's Final Request for Payment; Statement Concerning Claims; Release, Waiver and Discharge of Claims and Liens on the forms included in the Contract Documents; and such other completed documents as may be required by the Owner for the release of any monies held.

(b) The Contractor's Final Request for Payment shall be prepared on the basis of the Contract, including all authorized Change Orders, but not inclusive of proposals or claims of the Contractor which have not been accepted by executed Change Order. The Contractor's Final Request for Payment shall constitute a complete waiver and release of any and all claims by the Contractor except for unsettled claims that have been properly and timely filed as provided in the Contract and as are expressly and specifically stated and set forth in the Contractor's Statement Concerning Claims on the form for such included in the Special Conditions.

(c) The Statement Concerning Claims shall warrant that the Contractor has fully completed the performance of the Contract and the construction included in the Contract and has fully paid for all labor, materials, equipment, services, taxes and all other costs and expenses of every nature and kind whatsoever resulting from the Contract, except for any itemized payments due but not yet made as set forth in the statement of claims. If any dispute exists between the Contractor and any person, firm or corporation to which the Contractor might be obligated in connection with the Contract, the Contractor shall state the name of claimant and amount and general nature of the claim against the Contractor. Such Statement Concerning Claims shall also state the amount and nature of all present and future claims that the Contractor may have against the Owner relative to the Contract in addition to the Contractor's Final Request for Payment.

(d) After receipt of a properly completed Statement Concerning Claims and Contractor's Final Request for Payment, the Engineer will, within a reasonable time, make a recommendation to the Owner relative to acceptance of the construction. Such a recommendation shall not constitute a recommendation of acceptance of construction not furnished in accordance with the Contract. The Contractor's Final Request for Payment will be reviewed in the same manner as any other Contractor's Request for Payment.

(e) Upon receipt of the Statement Concerning Claims, and a Release and Waiver of Claims and Liens, in the form included in the Contract Documents, recommended Contractor's Final Request for Payment, any other documents necessary for the release of monies held, and the Engineer's recommendation relative to acceptance of the construction, the Owner will, within a reasonable time, take action on the Contractor's Final Request for Payment and on acceptance of the construction. Such action shall be subject to the conditions of the Performance Bond and Payment Bond, legal and contractual rights of the Owner, required warranties, and correction of

faulty construction after final payment. The Owner shall have the right to retain from any payment then due the Contractor, so long as any bills or claims remain unsettled and outstanding, including any asserted by the Owner, a sum sufficient, in the opinion of the Owner to provide for the payment of the same. It is also understood and agreed that, in case of any breach by the Contractor of the provisions hereof, the Owner may retain from any payment or payments, which may become due hereunder, a sum sufficient, in the opinion of the Owner, to compensate for all damages occasioned by such breach, including in such damages any damages arising out of delay on the part of the Contractor.

(f) The acceptance of construction will be evidenced by a Notice of Acceptance of Construction in writing signed by a duly authorized official of the Owner in the manner provided for written notices. No other act of the Owner shall constitute acceptance of the construction.

(g) Thirty (30) days after the Owner has accepted the construction, as above provided, the Contractor may submit a Request for Payment of the Retained Amount; provided, however, that the Owner may also retain such additional amounts and for such lengths of time as may be required by law or by the Special Conditions. If any liens remain unsatisfied after Payment of the Retained Amount is made, the Contractor shall immediately reimburse the Owner such amounts as the Owner may have been compelled to pay in discharging such liens including all costs and reasonable attorneys' fees.

Section 49: CONSTRUCTION FURNISHED PRIOR TO NOTICE TO PROCEED.

Notwithstanding any other provision of the Contract, the Owner shall not be obligated to accept or to pay for any construction furnished by the Contractor, prior to delivery of a written Notice to Proceed whether or not the Owner has knowledge of the furnishing of such construction.

Section 50: SALES AND SIMILAR TAXES.

The Contractor shall timely pay all federal, state, and local sales, excise or other taxes or assessments incurred or required to be collected or paid by the Contractor.

Section 51: CREDIT.

In the event construction is deleted or modified or specified material, equipment, method or process substituted so as to effect a reduction in cost, the Owner shall be entitled to a credit in an equitable amount.

Section 52: OWNER'S OPERATIONS.

The Contractor shall schedule all construction so as not to interfere with the operations of the Owner. Where such interference is essential to prosecution of the construction special arrangements shall be made and the written consent of the Owner as to time and method obtained forty-eight (48) hours in advance of the construction.

Section 53: OVERTIME INSPECTION.

In the event the Contractor elects to work on a Saturday, Sunday, a holiday, or longer than an eight-hour work shift on a regular working day, such work shall be considered as overtime work. On all such overtime work an Inspector, and a survey crew, if required, will be present, unless determined not necessary by the Owner. The Contractor shall reimburse the Owner for the full amount of the straight time plus overtime costs to the Owner for employees of the Owner, consultants, or government agencies required to work overtime hours.

The Contractor authorizes the Owner to deduct all such costs from any amounts due, or to become due the Contractor.

Overtime due to special construction problems, such as concrete finishing, asphalt rolling, making live sewer hookups, alleviating traffic problems, etc., will not be charged if the Engineer determines that the waiver of reimbursement of overtime charges is justified and deemed to be in the best interests of the Owner.

Section 54: OWNER'S CONSTRUCTION.

The Owner reserves the right to furnish in connection with the Project, construction which is not included in the Contract either by the Owner's forces or by the forces of other contractors.

Section 55: OTHER CONTRACTS.

(a) The Contractor shall ascertain to its own satisfaction the scope of the Project and the nature of any other contracts that have been or may be entered into by the Owner in the prosecution of the Project, to the end that the Contractor may perform the Contract in coordination with such other contracts, if any. Nothing herein contained shall be interpreted as granting to the Contractor exclusive occupancy of the Project site. The Contractor shall not cause any unreasonable hindrance or delay to any other contractor working on the Project. If, in the opinion of the Engineer, the performance of the Contract is likely to be interfered with by the simultaneous performance of some other contract or contracts to which the Owner is a party or by the Owner's own forces, the Owner may, but is not obligated to, decide which contractors shall cease a part of or all of their construction temporarily and which contractor shall continue, or whether the construction under all contracts can be coordinated so that all contractors may proceed simultaneously. The Owner shall not be responsible for any delays or damages suffered or extra costs incurred by the Contractor resulting directly or indirectly from the performance, failure to perform or attempted performance by any other contractor of any other contract.

(b) The Contractor shall afford other contractors reasonable opportunity for the introduction and storage of their materials and the execution of their construction at the Project site and shall properly connect and coordinate its construction with theirs. If another contractor or contractors are working in the same area, with equal rights and privileges, it shall be the responsibility of the Contractor to make whatever arrangements with said other contractors as are necessary for the proper execution and coordination of the construction.

(c) If any part of the Contractor's construction depends upon the construction of any other contractor for proper execution or results, the Contractor shall inspect the other contractor's construction and, at least ten (10) days prior to the time the Contractor begins construction on such part, report to the Engineer in writing any defects in such other contractor's construction that renders it unsuitable for such proper execution and results. Failure on the part of the Contractor to so inspect and report shall constitute an acceptance of the other contractor's construction as fit and proper for the reception of the Contractor's construction, except as to defects which may subsequently develop in the other contractor's construction.

(d) The Contractor agrees to save the Owner and the Engineer harmless from any claim, suit or demand of any other contractor by reason of the failure of the Contractor to conform with the Construction Schedule or construction time.

Section 56: LANDS BY OWNER.

Unless otherwise provided in the Special Conditions, the Owner will provide the lands upon which the construction under the Contract is to be furnished, together with the right-of-access to such lands. The Contractor shall confine its equipment, storage of materials, and construction operations to such limits as may be directed by the Owner, and shall not unreasonably encumber the premises with its materials; provided, however, such discretion by the Owner shall not impose upon the Owner any duty or responsibility for the safety or loss or damage to any equipment, materials, other property or project safety, all of such to remain the responsibility of Contractor.

Section 57: LANDS BY CONTRACTOR.

The Contractor shall provide at its own expense and with no cost or liability to the Owner, any additional land and access thereto, not shown or described in the Contract Documents as provided by the Owner that may be required for temporary construction facilities or storage of materials. The Contractor shall confine its equipment, storage of materials and operation of its workmen to those areas described in the Contract Documents and such additional areas as it provides at its own expense.

Section 58: EMPLOYEES.

The Contractor shall at all times enforce strict discipline and good order among its employees and shall not employ or continue to employ on the Project anyone not skilled in the work assigned to it or any person unsatisfactory to the Owner. All employees who perform any work shall be properly licensed, and shall be the holders of all certificates of fitness, and permits as may be required by law.

Section 59: PROJECT SAFETY.

(a) The Contractor shall exercise all precautions for the safety of its employees and of the general public and of the Owner's employees and property, and shall comply with all applicable provisions of federal, state, and municipal safety laws, building and construction codes, and the safety rules and other regulations of the Owner, including, but not limited to, the requirements of

the U.S. Occupational Safety and Health Administration (OSHA) or applicable state statutes in lieu thereof. The Contractor shall also comply with the recommendations in the "Manual of Accident Prevention in Construction of the Associated General Contractors of America" insofar as applicable, unless such recommendations are incompatible with federal, state or municipal laws or regulations. Monthly reports of all lost-time accidents shall be promptly submitted to and shall include such data as are requested by the Owner.

(b) The Contractor shall enforce all instructions of the Owner regarding signs, advertising, fires, danger signals, barricades, and smoking, and shall require all persons employed in the construction to comply with all building, post or institutional regulations while on the premises. The Contractor shall require all employees to be familiar with and comply with the Owner's safety regulations. The Contractor shall not permit any part of any structure to be loaded with a weight exceeding its maximum allowable loading or that will otherwise jeopardize its safety.

(c) Existing traffic and street name signs which will interfere with construction shall be removed by the Contractor and stored in a safe place. These signs shall not be removed until the Engineer has so directed and until the necessary measures have been taken to safeguard traffic after the signs have been removed. Preservation and maintenance of the signs shall be the sole responsibility of the Contractor. Upon completion of the project, the Contractor will reset all such signs in their permanent location at no cost to the Owner.

(d) The Contractor shall provide adequate signs, barricades, signal lights and watchmen and take all necessary precautions for the protection of the construction and the safety of the public. All barricades and obstructions shall be protected at night by satisfactory signal lights which shall be kept lighted from sunset to sunrise. Barricades shall be constructed, painted, and placed in accordance with the manual on Uniform Traffic Control Devices, published by the United States Department of Transportation.

(e) The Contractor shall at all times so conduct its work as to ensure the least possible obstruction to traffic and inconvenience to the general public and the residents in the vicinity of the Project, and to ensure the protection of persons and property in a manner satisfactory to the Owner. No road or street shall be closed to the public except with the permission of the Owner and the proper governmental authority. Emergency traffic such as police, fire and disaster units, shall be provided reasonable access at all times. The Contractor shall be liable for any damages which may result from his failure to provide such reasonable access.

(f) When work is being performed below the standards required herein, or other applicable standards, or when the Engineer or Owner believes the condition endangers the safety of the general public, employees of the Project, or any property, including the buildings or property of the Owner, the Engineer may immediately issue a written stop-work order describing the sub-standard work and deliver the same to the Contractor. The Contractor shall cease work and not resume work on the stopped portion of the project until acceptable remedial action has been taken. Such protective measures shall not be construed as releasing the Contractor of any obligation or liability arising under the Contract and shall be at no cost, expense, or liability, for stopping the work of otherwise, to the Owner.

Section 60: INSTRUMENT SURVEYS.

(a) The Owner will furnish the instrument surveys necessary to establish certain bench marks, base lines and property boundaries specifically noted on the Contract Drawings and such construction surveys, if any, as are specifically required to be provided by the Owner in the Special Conditions. From the information provided by the Owner, the Contractor shall develop and make such additional detailed surveys as are needed for construction, such as slope stakes, batter boards, stakes for pile locations and other working points, lines and elevations.

(b) All bench marks, base lines, and property boundaries, as originally established by the Owner, shall thereafter be maintained by the Contractor who shall be responsible for keeping their accuracy and who shall pay to the Owner the reasonable cost to the Owner of re-establishing them if they are disturbed. The Contractor shall notify the Engineer in writing at least ten (10) days in advance of the time the Contractor will commence work on any parts of the construction requiring surveys to be furnished by the Owner.

(c) The Contractor shall provide reasonable and necessary opportunities and facilities to the Engineer for setting points and making measurements during construction.

Section 61: PROTECTION OF PROPERTY.

(a) The Contractor shall continuously maintain full and adequate protection of all its construction, the Owner's buildings and other property and the adjacent public and private property from damage, injury, or loss arising from, or in relation to, the construction. The Contractor shall promptly pay for any damage, injury or loss resulting from the act or omission of Contractor or the lack of adequate protection, and upon the failure to do so the Owner shall be entitled to withhold and pay from any amounts otherwise due the Contractor, or from any retainage, any such claim for damages or pursue any other remedy, including suspension or termination of the Contract without liability.

(b) The Contractor shall not enter upon public or private property for any purpose without obtaining permission from the proper public authority or private property owner. In the event of construction on state highways, city or public roads, or any public right-of-way, it will be the Contractor's responsibility to notify the authority having jurisdiction thereover before beginning construction and to ascertain that the schedule of operations proposed is satisfactory to the authority.

(c) Wherever construction under the Contract is undertaken on easements or rights-of-way over private property, or public easements, rights-of-way, or franchise, all construction operations shall be confined to the limits of such easement, right-of-way or franchise and be completed so as to cause the least amount of disturbance and a minimum amount of damage.

(d) Construction across public or private property shall be carried out in one (1) continuous operation with immediate restoration and cleanup of the construction area. If the Contractor should fail to perform such construction, restoration and cleanup continuously, the

Owner may give the Contractor a written notice to do so. In the event of failure by the Contractor to complete such construction, restoration and cleanup within five (5) days after receipt of such notice, the Owner may complete the same to the extent the Owner deems advisable. The cost of all labor, material, supervision and other expenses incurred by the Owner in so doing shall be paid by the Contractor to the Owner and may be deducted from any payments due the Contractor under the Contract.

(e) The Contractor shall protect and maintain all underground or above-ground utilities and structures affected by the construction and all lawns, shrubs, trees, fences, and other improvements on property crossed by or adjacent to its operations, and all damage shall be repaired and restored by the Contractor at its expense in a satisfactory manner. The Contractor will be responsible for all damage caused by its construction to roads, highways, ditches, walls, bridges, culverts, utilities, barricades, lights or other property, whether such damage be at the Project site or elsewhere and the Contractor shall repair or replace at its own expense all such damage in a satisfactory manner.

(f) It is expressly understood that the Contractor shall restore, at Contractor's sole cost and expense, all property, whether public or private, the use of which is obtained by easement, permit or right-of-way, to a condition at least equal to its original condition. Before beginning construction the Contractor shall file with the Engineer properly identified and dated photographs of such property as may be designated on the Contract Drawings or described in the Special Conditions.

Section 62: CUTTING AND PATCHING.

The Contractor shall at its own expense do all necessary cutting and patching of its construction that may be required in order to properly receive the construction of other contractors on the project or as required by the Contract Documents. The Contractor shall restore all such cut or patched construction to a condition satisfactory to the Owner. The cost resulting from replacement of defective cutting and patching construction shall be borne by the Contractor.

Section 63: CLEANUP.

At the time of termination or suspension for an extended period of all or any portion of the construction, or at completion but before final acceptance by the Owner, the Contractor at its own expense shall remove from the Owner's property and from all public and private property, all of its equipment and such unused materials as the Owner has made no payment for, temporary structures, rubbish and waste materials resulting from its operations and leave the Project site in a neat and orderly fashion satisfactory to the Owner. The Contractor shall at all times during the progress of the construction maintain the site in as neat and orderly a condition as construction operations will permit. In the event the Contractor fails to do so, in addition to any other remedy, including declaring the Contractor in default, the Owner may remove and store such equipment and unused materials and dispose of rubbish and waste at the expense of the Contractor. The cost of such removal, storage and disposal may be deducted from any payment due the Contractor.

Section 64: SANITARY PROVISIONS.

The Contractor shall furnish and maintain temporary toilet facilities of a type, number and location satisfactory to the Owner and all public authorities having jurisdiction, for all workmen employed for the Project. The Contractor shall maintain the same in a sanitary condition from the beginning of the construction until completion and shall then remove the temporary toilet facilities and disinfect the premises.

Section 65: INDEX OF ACCOUNTS.

Prior to final payment, or at any other time if requested by Owner to evaluate any claim, or potential claim by the Contractor, and at the option of the Owner, the Contractor shall furnish to the Owner a complete accounting of the actual costs of labor, material, and other charges, and certified copies of all invoices for materials and payrolls for all labor incorporated into the Project.

Section 66: EXISTING UTILITIES AND IMPROVEMENTS.

(a) The Contractor shall remove such existing improvements on the Project site as may be necessary for the performance of the construction and, unless otherwise specified in the Special Conditions, shall rebuild the existing improvements in as good a condition as found; provided that existing improvements which interfere with the performance of the construction shall be maintained by the Contractor until their removal is authorized or directed by the Owner.

(b) The Contractor shall make all necessary arrangements and do all things required to avoid interference with the maintenance and operation of power, telegraph, telephone, water, sewer, gas and other utility lines, properties, and facilities of every kind, all in a manner satisfactory to the owners and operators thereof.

(c) If construction under the Contract crosses highways, railroads, streets, or other utilities under the jurisdiction of the state, borough, cities, federal government, or other public body, public utility, or private entity, the Contractor shall secure written permission from the proper authority before executing such construction. A copy of this written permission shall be filed with the Owner before any construction is started. The Contractor shall furnish a written release from the proper authority before final acceptance of the construction by the Owner.

(d) Existing utilities indicated anywhere on the Contract Drawings have been plotted from information currently available to the Engineer. The source of information generally consists of construction records and other data obtained verbally from officials associated with the particular utility. The data is shown on the Contract Drawings for whatever benefit the Contractor may derive, and unless specific instructions or data concerning certain utilities are set forth in the Special Conditions, the data shown on the Contract Drawings shall not necessarily be considered precise or complete, and the Owner and the Engineer make no guarantee as to completeness, precision or dimensions, and that other aboveground or underground utilities or facilities not shown on the Contract Drawings may be encountered during the course of construction. In any case, minor lines, such as water, gas and sewer may not be indicated. This shall in no way relieve

the Contractor from its responsibility for maintenance of existing utilities and performance of the Contract. Under no circumstances will errors or omissions in location of existing utilities or improvements, whether they be visible from the surface, buried or otherwise obscured, be considered as a basis for additional compensation to the Contractor.

(e) The Contractor shall be responsible for all damage to existing utilities and facilities during construction and shall restore all damaged facilities to their original condition to the satisfaction of the Owner and the Owner of the utilities and facilities at no cost to the Owner.

Section 67: INDEPENDENT CONTRACTOR; NO AUTHORITY TO BIND OWNER.

The Contractor is an independent Contractor and is not, and shall not be construed to be a partner, joint venturer, employee or agent of the Owner and shall not, and is not authorized to, enter into or make any contracts, agreements, or enter into any other understanding with any other person, corporation, partnership, joint venturer, or other entity, in the name of the Owner.

Section 68: NO THIRD PARTY BENEFICIARIES.

Nothing in this Contract shall be construed to give any person other than the Owner and the Contractor any legal or equitable right, remedy or claim under this Contract, but it shall be held to be for the sole and exclusive benefit of the Owner and the Contractor.

Section 69: CONTRACTOR QUALIFIED.

The Contractor expressly represents and warrants it is the holder of all professional, business or other licenses or permits and is qualified and capable of performing all of the work covered or called for by the Contract and is presently ready, able and willing to undertake and perform all of such work and services, and supply all necessary materials, in a good, safe, and workmanlike manner, at the times, in the manner, and pursuant to the terms, conditions and provisions, and for the compensation and payments provided for in the Contract.

Section 70: ENTIRE AGREEMENT.

This Contract, and any schedules, appendices or exhibits attached thereto set forth all the covenants, promises, agreements, conditions and understandings between the parties hereto, and there are no covenants, promises, agreements, conditions or understandings, either oral or written, between them other than as herein set forth. Except as herein otherwise expressly provided, no contemporaneous or subsequent agreement, understanding, alteration, amendment, change or addition thereto, or any schedule, appendix, exhibit or attachment thereto shall be binding upon the parties hereto. This Contract constitutes a final, complete and exclusive statement of the agreement between the parties.

Section 71: LAW APPLICABLE.

The laws of the State of Alaska shall govern the construction, validity, performance and enforcement of this Contract. Venue as to any action, claim, or proceeding arising out of, or based upon this Contract, including, but not limited to, any action for declaratory or injunctive relief, shall be the appropriate court sitting in the City of Ketchikan, First Judicial District, Alaska.

Section 72: REMEDIES.

Except as may be otherwise provided in this Contract, all disputes, claims, counterclaims, and other matters in question between the Owner and the Contractor arising out of or relating to this Contract or the breach thereof will be decided in a court of competent jurisdiction.

SPECIAL CONDITIONS

The General Conditions are supplemented and/or amended by the following Special Conditions:

Section 1: PAYMENTS

(a) Retainage

Until such time as the work is accepted by the Owner, the retained percentage may be ten percent (10%) of the value of the completed work, provided, however, when the dollar value of the completed work has reached fifty percent (50%) or more, the Contractor may request that the retainage be reduced to five percent (5%). The Owner may, but shall not be required to, reduce the retainage based on the Contractor's progress schedule, clean-up, contract completion cost, and other factors.

Should the amount due the Contractor under the estimate and Request for Payment for any given month be less than five thousand dollars (\$5,000), at the option of the Engineer, no payment shall be made for that month.

Partial payments shall not be construed as an acceptance or approval of any part of the work covered thereby, and they shall in no manner relieve the Contractor of responsibility for defective workmanship or material.

The estimates upon which partial payments are based are not represented to be accurate estimates, and all quantities shown therein are subject to correction in the final estimate. If the Contractor uses such estimates as a basis for making payment to subcontractors, he does so at his own risk, and he shall bear all loss that may result.

The making of partial payments under the Contract, either before or after the date set for completion of the work, shall not operate to invalidate any of the provisions of the Contract or release the surety.

At the time payment is made for any materials which have been stored at or near the site, the ownership of such materials shall vest in the Owner, and they shall remain in storage until used on the work, however, the Contractor shall have the continuing duty and responsibility to protect all such items and any loss or damage thereto shall be at the cost and expense of, and shall be paid by the Contractor. Such materials shall not be used on other work.

(b) Advances on Material

For materials delivered and held in storage upon the work (or near the site of the work if approved by the Engineer), allowances will be made in the partial payments

to the Contractor. These allowances shall be in amounts not exceeding one hundred percent (100%) of the net cost to the Contractor of the material f.o.b. the work, and from such allowances there shall be retained the percentages regularly provided for in connection with partial payments.

At the option of the Engineer, no allowance for materials shall be made on any partial payment or estimate unless the total allowable value for all materials on hand is at least one thousand dollars (\$1,000) and no allowance shall be made upon any single class of material the value of which is not at least five hundred dollars (\$500). The inventory of materials for which advances are requested shall be kept to a reasonable size as approved by the Engineer. No allowance shall be made upon fuels, supplies, forms, lumber, falsework, or other materials, or on temporary structures of any kind, which will not become an integral part of the finished construction.

As a basis for determining the amount of advances on material, the Contractor shall make available to the Engineer such invoices, freight bills, and other information concerning the materials in question, as the Engineer may request.

Should there be reasonable evidence, in the opinion of the Engineer, that the Contractor is not making prompt payment for materials on hand, allowances for material on hand will be omitted from partial payment.

(c) **Allowances for Materials Left on Hand**

Materials not required by the unit or lump sum prices named in the Bid Proposal but delivered to the work at the order of the Engineer but left unused due to changes in plans, shall, if the materials are not practicably returnable for credit, be purchased from the Contractor by the Owner at their actual cost (without percentage allowance for profit), and shall thereupon become the property of the Owner.

(d) **Final Payment**

Final estimate and final request for payment shall be made as provided in Section 48 of the General Conditions.

(e) **Suspension of Payments**

No partial or final payment shall be made as long as any order made by the Engineer to the Contractor in accordance with the specifications or Contract Documents remains uncomplished with.

(f) **Correction of Work after Final Payment**

Neither payment of all or any portion of the contract price, final acceptance, notice

of acceptance of construction, nor any provision in the Contract Documents shall relieve the Contractor of responsibility for faulty materials or workmanship. Contractor shall remedy any defects due thereto and proceed as provided in Section 265, Warranties, and as otherwise provided in the Contract.

(g) **Payments**

Payments under the Contract shall be paid in cash (check) by the Owner unless otherwise provided.

(h) **Final Payment - Certificate of Compliance**

No final payment shall be made until the Contractor shall file with the Engineer, prior to acceptance of the work, a Certification of Compliance in form substantially as follows: "I (we) hereby certify that all work has been performed and materials supplied in accordance with the plans, specifications, and contract documents for the above work, and that:

- a. Not less than the prevailing rates of wages as ascertained by the governing body of the contracting agency has been paid to laborers, workmen and mechanics employed on this work;
- b. There have been no unauthorized substitutions of subcontractors; nor have any subcontracts been entered into without the names of the subcontractors having been submitted to the Engineer prior to the start of such subcontracted work;
- c. No subcontract was assigned or transferred or performed by any subcontractor other than the original subcontractor, without prior notice having been submitted to the Engineer together with the names of all subcontractors;
- d. All claims for material and labor and other service performed in connection with these specifications have been paid;
- e. All monies due to the State Industrial Accident Fund, the State Unemployment Compensation Trust Fund, the State Tax Commission, Hospital Associations, and/or others have been paid;
- f. No asbestos containing materials have been incorporated in the project and the project is "asbestos-free".

(i) **Final Release**

Before the Owner pays the Contractor the final payment for the work, the Contractor shall sign and deliver to the Owner a statement of claims and final release sworn to under oath and duly notarized on the form included in these

contract documents.

Section 2: FORMS

The form of Contractor's Request for Payment, the Statement of Claims, and the Final Release, that shall be required and used shall be on the forms set forth and included in these contract documents.

Section 3: ALASKA FOREST PRODUCTS

Pursuant to AS 36.15.010 timber, lumber, and manufactured lumber products originating in this state from local forests shall be used wherever practical or specified.

Section 4: ARCHAEOLOGICAL REMAINS

Pursuant to AS 41.35 Construction shall be halted if archaeological remains are uncovered in order to permit archaeological survey. The Contractor shall notify the Owner and the State Archaeologist, Department of Natural Resources, if archaeological remains are found. The Owner will then address and resolve the matter.

Section 5: LIQUIDATED DAMAGES

Pursuant to Section 7 of the General Conditions, liquidated damages for failure to complete all work called for under the Contract Documents by the time required to complete such work, as specified in Section 2 (Construction time) of the Agreement and Section 6 of these Special Conditions, are fixed at Four Hundred Dollars (\$400.00) per calendar day.

Section 6: CONSTRUCTION TIME

Construction Time is June 7, 2021 to August 31, 2021.

Section 7: SITE ACCESS

All access to the project site prior to the June 7, 2021 must be coordinated with the Director of Maintenance, Craig City School District.

**SECTION 011000
SUMMARY**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Project information.
 - 2. Work covered by Contract Documents.
 - 3. Work under separate contracts.
 - 4. Access to site.
 - 5. Coordination with occupants.
 - 6. Work restrictions.
 - 7. Specification and Drawing conventions.

- B. Related Requirements:
 - 1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.2 PROJECT INFORMATION

- A. Project Identification: Craig High School Biomass Project
 - 1. Project Location: 1 Panther Way, Craig, AK 99921.
 - 2. Owner: Owner's Representative: Chris Reitan, Superintendent, Craig City School District, PO Box800/100 School Rd., Craig, AK, 99921 (907)826.3274

- B. Project Manager: R&M Engineering-Ketchikan, Inc., 7180 Revilla Road, Suite 300, Ketchikan, AK 99901, (907) 225-7197.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and consists of the following:
 - 1. The project consists of the alteration of an existing 2,130 SF pre-manufactured metal shop building to house a new biomass boiler system. The project also consists of an 840 SF pre-manufactured metal building addition with metal SIP wall and roof panels to house shop classroom space and a 360 SF concrete wood chip storage bunker. Existing metal siding and roofing is to be removed and replaced with new metal SIP wall and roof panels to match new at addition.

Site work consists of regrading and widening an existing walking path for a new gravel access road along with the installation of a new rock retaining wall.

Mechanical work consists of the installation of a new biomass boiler system at new addition and tying into the existing mechanical boiler system of the adjacent main school building.

Electrical work consists of new lighting, power, and heat at additions and for the new boiler system. Some modification of existing electrical will be expected.

Refer to the Contract Documents for all indicated Work.

B. Type of Contract:

1. Project will be constructed under a single prime contract.

1.4 WORK UNDER SEPARATE CONTRACTS

- A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying Work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.

1.5 ACCESS TO SITE

- A. General: Each Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.
- B. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
1. Driveways, Walkways, and Entrances: Keep driveways loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.
- C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

1.6 COORDINATION WITH OCCUPANTS

- A. Partial Owner Occupancy: Owner will occupy the premises during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to

interfere with Owner's operations. Maintain existing exits unless otherwise indicated.

1. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

B. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.

1.7 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

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

B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 6:30 a.m. to 7:00 p.m., Seven days a week, unless otherwise indicated.

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

1. Notify Project Manager & Owner not less than two days in advance of proposed utility interruptions.

D. Restricted Substances: Use of tobacco products and other controlled substances within the existing building or on Project site is not permitted.

1.8 SPECIFICATION AND DRAWING CONVENTIONS

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

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

**SECTION 012600
CONTRACT MODIFICATION PROCEDURES**

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Project Manager will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
1. Work Change Proposal Requests issued by Project Manager are not instructions either to stop work in progress or to execute the proposed change.
 2. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Project Manager within 21 days of the notice of the claim.
1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed

change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.

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

1.3 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Work Change Proposal Request, Project Manager will issue a Change Order for signatures of Owner and Contractor on AIA Document G701 or similar document.

1.4 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Project Manager may issue a Construction Change Directive on AIA Document G714 or similar document. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.
- C. Documentation: Maintain detailed records on a time and material basis of work required by the Work Change Directive.
 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

**SECTION 013100
PROJECT MANAGEMENT AND COORDINATION**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. Requests for Information (RFIs).
 - 2. Project meetings.

1.2 DEFINITIONS

- A. RFI: Request from Owner, Project Manager, or Contractor seeking information required by or clarifications of the Contract Documents.

1.3 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.

1.4 REQUESTS FOR INFORMATION (RFIs)

- A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
 - 1. Project Manager will return RFIs submitted to Project Manager by other entities controlled by Contractor with no response.
 - 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
 - 1. Project name.
 - 2. Date.

3. Name of Contractor.
 4. Name of Project Manager.
 5. RFI number, numbered sequentially.
 6. RFI subject.
 7. Specification Section number and title and related paragraphs, as appropriate.
 8. Drawing number and detail references, as appropriate.
 9. Field dimensions and conditions, as appropriate.
 10. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 11. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
- C. RFI Forms: AIA Document G716 Software-generated form with substantially the same content as indicated above, acceptable to Project Manager.
- D. Project Manager's Action: Project Manager will review each RFI, determine action required, and respond. Allow seven working days for Project Manager's response for each RFI. RFIs received by Project Manager after 1:00 p.m. will be considered as received the following working day.
1. Project Manager's action may include a request for additional information, in which case Project Manager's time for response will date from time of receipt of additional information.
 2. Project Manager's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Project Manager in writing within 10 days of receipt of the RFI response.

1.5 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Project Manager of scheduled meeting dates and times.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Project Manager, within three days of the meeting.

- B. Preconstruction Conference: Project Manager will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Project Manager, but no later than 15 days after execution of the Agreement.
1. Attendees: Authorized representatives of Owner and Project Manager, Contractor and its superintendent; major subcontractors and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 - a. Unless previously submitted to the Project Manager or Owner, the Contractor shall bring one copy of each of the following submittals:
 - 1) Project Overview Bar Chart Schedule, based on Critical Path scheduling.
 - 2) Procurement schedule of Major equipment and materials requiring long lead times.
 - 3) Shop Drawings, Samples, Submittal Schedule.
 - 4) Name and telephone number of Contractor's representatives, including on- site Superintendent.
 - 5) Schedule of Values.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Critical work sequencing and long-lead items.
 - c. Designation of key personnel and their duties.
 - d. Procedures for processing field decisions and Change Orders.
 - e. Procedures for RFIs.
 - f. Procedures for testing and inspecting.
 - g. Procedures for processing Applications for Payment.
 - h. Submittal procedures.
 - i. Preparation of record documents.
 - j. Use of the premises and existing building.
 - k. Work restrictions.
 - l. Working hours.
 - m. Owner's occupancy requirements.
 - n. Responsibility for temporary facilities and controls.
 - o. Procedures for moisture and mold control.
 - p. Procedures for disruptions and shutdowns.
 - q. Parking availability.
 - r. Office, work, and storage areas.
 - s. Equipment deliveries and priorities.
 - t. First aid.

- u. Security.
 - v. Progress cleaning.
 - 3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
- 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Project Manager of scheduled meeting dates.
 - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration.
 - 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 - 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
 - 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: Conduct progress meetings at regular intervals.
- 1. Attendees: In addition to representatives of Owner and Project Manager, each contractor, subcontractor, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - 3. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

**SECTION 013300
SUBMITTAL PROCEDURES**

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Definitions.
- B. Submittal procedures.
- C. Proposed product list.
- D. Product data.
- E. Shop Drawings.
- F. Samples.
- G. Other submittals.
- H. Design data.
- I. Test reports.
- J. Certificates.
- K. Construction photographs.
- L. Contractor review.
- M. Owner/Engineer review.

1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Owner/Engineer's responsive action.
- B. Informational Submittals: Written and graphic information and physical Samples that do not require Owner/Engineer's responsive action. Submittals may be rejected for not complying with requirements.

1.3 SUBMITTAL PROCEDURES

- A. Transmit each submittal with Submittal Transmittal Form provided to Contractor by Project Manager.
- B. Sequentially number transmittal forms. Mark revised submittals with original number and sequential alphabetic suffix.
- C. Identify: Project, Contractor, Subcontractor and supplier, pertinent Drawing and detail number, and Specification Section number appropriate to submittal.
- D. Apply Contractor's stamp, signed or initialed, certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is according to requirements of the Work and Contract Documents.

- E. Schedule submittals to expedite Project.
- F. For each submittal for review, allow minimum 15 days excluding delivery time to and from Contractor.
- G. Identify variations in Contract Documents and product or system limitations that may be detrimental to successful performance of completed Work.
- H. Allow space on submittals for Contractor and Project Manager/Consultant review stamps.
- I. When revised for resubmission, identify changes made since previous submission.
- J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report inability to comply with requirements.
- K. Submittals not requested will not be recognized nor processed.
- L. Incomplete Submittals: Project Manager will not review. Complete submittals for each item are required. Delays resulting from incomplete submittals are not the responsibility of Project Manager.

1.4 PROPOSED PRODUCT LIST

- A. Within 15 days after date of Notice to Proceed, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
- B. For products specified only by reference standards, indicate manufacturer, trade name, model or catalog designation, and reference standards.

1.5 PRODUCT DATA

- A. Product Data: Action Submittal: Submit to Owner/Engineer for review for assessing conformance with information given and design concept expressed in Contract Documents.
- B. Submit electronic submittals via email as PDF electronic files.
- C. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- D. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

- E. After review, produce copies and distribute according to "Submittal Procedures" Article and for record documents described in Section 017000 - Execution and Closeout Requirements.

1.6 SHOP DRAWINGS

- A. Shop Drawings: Action Submittal: Submit to Project Manager for assessing conformance with information given and design concept expressed in Contract Documents.
- B. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. When required by individual Specification Sections, provide Shop Drawings signed and sealed by a professional Engineer responsible for designing components shown on Shop Drawings.
 - 1. Include signed and sealed calculations to support design.
 - 2. Submit Shop Drawings and calculations in form suitable for submission to and approval by authorities having jurisdiction.
 - 3. Make revisions and provide additional information when required by authorities having jurisdiction.
- D. Submit electronic submittals via email as PDF electronic files.
- E. After review, produce copies and distribute according to "Submittal Procedures" Article and for record documents described in Section 017000 - Execution and Closeout Requirements.

1.7 SAMPLES

- A. Samples: Action Submittal: Submit to Project Manager for assessing conformance with information given and design concept expressed in Contract Documents.
- B. Samples for Selection as Specified in Product Sections:
 - 1. Submit to Project Manager for aesthetic, color, and finish selection.
 - 2. Submit Samples of finishes, textures, and patterns for Project Manager selection.
- C. Submit Samples to illustrate functional and aesthetic characteristics of products, with integral parts and attachment devices. Coordinate Sample submittals for interfacing work.
- D. Include identification on each Sample, with full Project information.
- E. Submit number of Samples specified in individual Specification Sections; Project Manager will retain one.

- F. Reviewed Samples that may be used in the Work are indicated in individual Specification Sections.
- G. Samples will not be used for testing purposes unless specifically stated in Specification Section.
- H. After review, produce copies and distribute according to "Submittal Procedures" Article and for record documents described in Section 017000 - Execution and Closeout Requirements.

1.8 OTHER SUBMITTALS

- A. Closeout Submittals: Comply with Section 017000 - Execution and Closeout Requirements.
- B. Informational Submittal: Submit data for Project Manager's knowledge as Contract administrator or for Owner.
- B. Submit information for assessing conformance with information given and design concept expressed in Contract Documents.

1.9 TEST REPORTS

- A. Informational Submittal: Submit reports for Project Manager's knowledge as Contract administrator or for Owner.
- B. Submit test reports for information for assessing conformance with information given and design concept expressed in Contract Documents.

1.10 CERTIFICATES

- A. Informational Submittal: Submit certification by manufacturer, installation/application Subcontractor, or Contractor to Project Manager, in quantities specified for Product Data.
- B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- C. Certificates may be recent or previous test results on material or product but must be acceptable to Project Manager.

1.11 CONSTRUCTION PHOTOGRAPHS

- A. Provide photographs of construction throughout progress of Work as specified and acceptable to Project Manager.

1.12 CONTRACTOR REVIEW

- A. Review for compliance with Contract Documents and approve submittals before transmitting to Project Manager.
- B. Contractor: Responsible for:
 - 1. Determination and verification of materials including manufacturer's catalog numbers.
 - 2. Determination and verification of field measurements and field construction criteria.
 - 3. Checking and coordinating information in submittal with requirements of Work and of Contract Documents.
 - 4. Determination of accuracy and completeness of dimensions and quantities.
 - 5. Confirmation and coordination of dimensions and field conditions at Site.
 - 6. Construction means, techniques, sequences, and procedures.
 - 7. Safety precautions.
 - 8. Coordination and performance of Work of all trades.
- C. Stamp, sign or initial, and date each submittal to certify compliance with requirements of Contract Documents.
- D. Do not fabricate products or begin Work for which submittals are required until approved submittals have been received from Project Manager.

1.13 PROJECT MANAGER REVIEW

- A. Do not make "mass submittals" to Project Manager. "Mass submittals" are defined as three or more submittals or items in one day or six or more submittals or items in one week. If "mass submittals" are received, Project Manager's review time stated above will be extended as necessary to perform proper review. Project Manager will review "mass submittals" based on priority determined by Project Manager.
- B. Informational submittals and other similar data are for Project Manager's information, do not require Project Manager's responsive action, and will not be reviewed or returned with comment.
- C. Submittals made by Contractor that are not required by Contract Documents may be returned without action.
- D. Submittal approval does not authorize changes to Contract requirements unless accompanied by Change Order.

E. Owner may withhold monies due to Contractor to cover additional costs beyond the second submittal review.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 013300

**SECTION 015000
TEMPORARY FACILITIES AND CONTROLS**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.

1.2 USE CHARGES

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Architect, testing agencies, and authorities having jurisdiction.
- B. Water Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
- C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

PART 2 - PRODUCTS

2.1 EQUIPMENT

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

PART 3 - EXECUTION

3.1 TEMPORARY UTILITY INSTALLATION

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

- B. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- D. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.

3.2 SUPPORT FACILITIES INSTALLATION

- A. Traffic Controls: Comply with requirements of authorities having jurisdiction.
 - 1. Protect existing site improvements to remain including curbs, pavement, and utilities.
 - 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- B. Parking: Use designated areas of Owner's existing parking areas for construction personnel.
- C. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."

3.3 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
- B. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- C. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

3.4 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.

- B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect materials from water damage and keep porous and organic materials from coming into prolonged contact with concrete.
- C. 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:
 - 1. Discard or replace water-damaged and wet material.
 - 2. Discard, replace, or clean stored or installed material that begins to grow mold.
 - 3. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

3.5 OPERATION, TERMINATION, AND REMOVAL

- A. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 - 1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
 - 2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

SECTION 017300 EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Installation of the Work.
 - 2. Cutting and patching.
 - 3. Progress cleaning.
 - 4. Protection of installed construction.

- B. Related Requirements:
 - 1. Section 011000 "Summary" for limits on use of Project site.
 - 2. Section 017700 "Closeout Procedures" for submitting documents.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: 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 Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. 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 walls and roofs for suitable conditions where products and systems are to be installed.

2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected. 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 caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

3.3 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
1. Make vertical work plumb and make horizontal work level.
- 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 the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.4 CUTTING AND PATCHING

- A. Cutting and Patching, 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. Adjacent Occupied Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- 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. Provide materials and comply with installation requirements specified in other Sections, where applicable.
 - 1. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
 - 2. 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.

3.5 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.
- 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. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

END OF SECTION 017300

**SECTION 017700
CLOSEOUT PROCEDURES**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout and final payment, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Final cleaning.
 - 4. Repair of the Work.

1.2 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.

1.3 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.4 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Project Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Project Manager will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Project Manager, that must be completed or corrected before certificate will be issued.
 - 1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 - 2. Results of completed inspection will form the basis of requirements for final completion.

1.5 FINAL COMPLETION PROCEDURES

- A. Inspection: Submit a written request for final inspection to determine acceptance. On receipt of request, Project Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Project Manager will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
 - 1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Leave Project clean and ready for occupancy.

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.

END OF SECTION 017700

**SECTION 017839
PROJECT RECORD DOCUMENTS**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
 - 1. Record Drawings.
 - 2. Record Product Data.

1.2 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit one set(s) of marked-up record prints.
- B. Record Product Data: Submit one paper copy or an annotated PDF electronic files and directories of each submittal.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised Drawings as modifications are issued.
 - 1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Record data as soon as possible after obtaining it.
 - c. Record and check the markup before enclosing concealed installations.
 - 2. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
 - 3. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

- B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION 017839

**SECTION 020210
EXISTING UTILITIES**

PART 1 - GENERAL

1.1 PUBLIC AND PRIVATE UTILITIES

- A. Existing above-ground utilities, including but not limited to power transmission and distribution, telegraph, telephone and traffic control systems, whether shown on the drawings or not, shall be maintained, relocated, rerouted, removed and restored as may be necessary by the Contractor in a manner satisfactory to owners and operators of the utilities.

- B. Existing major underground utilities and appurtenant structures, whether shown on the drawings or not, shall be maintained, relocated, rerouted, removed and restored by the Contractor. In the following special cases, the Contractor will be reimbursed in accordance with the General Conditions for all costs of modifying, rerouting, relaying or maintaining service of major underground utilities.
 - 1. An existing utility is found during construction to cross the ditch line at an elevation between the top and bottom of the proposed pipeline or structure to be constructed under this contract together with the required pipe zone.
 - 2. An existing underground utility is found during construction to cross or project within the utility conflict limits for the proposed work at an angle of 30° or less at any elevation.
 - 3. For the purposes of these special cases, utility conflict limit shall be two (2) feet either side of the edge of the pipe.
 - 4. The existing water line is excluded from this special case and no reimbursement will be made for conflicts.
 - 5. In no case shall the Contractor be reimbursed if the conflict is clearly shown on the drawings.

- C. Minor underground utility service lines, including but not limited to sanitary sewer services, gas services, water services, house or yard drains, and electricity or telephone services and driveway culverts shall be maintained, relocated, rerouted, removed and restored by the Contractor with the least possible interference with such services and in no case shall the interference of such service lines be considered for extra compensation under any of the special cases listed above, except sanitary sewer service occurring at an elevation between the top and bottom of the proposed pipeline or structure together with the pipe zone.

- D. The right is reserved by owners of public utilities and franchises to enter upon any street, road, right-of-way, or easement for the purpose of maintaining their property and for making necessary repairs or adjustments caused by the Contractor's operations. The Contractor shall save the Owner harmless of any costs so incurred.

- E. For purpose of this section, "pipe zone" is defined as extending from the bottom of the required excavation to six (6) inches over the top of the pipe.

PART 2 – PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 QUALITY ASSURANCE

- A. It is recommended that the Contractor make arrangements with the applicable utility company or department to aid in the location and maintenance of existing utilities.

3.2 RESTORATION OF DRAINAGE FACILITIES

- A. Where it is necessary for drainage facilities to be removed and replaced, existing pipe and catch basins may be reinstalled when approved by the agency having jurisdiction.
- B. The materials shall be cleaned.
- C. When it is necessary to replace existing pipe or catch basins, the new materials shall be of equal strength and similar design to existing materials.
- D. Installation shall be in accordance with the applicable provisions of these specifications.
- E. All costs, whether new or existing facilities are installed, shall be considered to be included in the prices bid for the various items and no additional payment shall be allowed.

END OF SECTION 020210

**SECTION 023000
SUBSURFACE CONDITIONS**

PART 1 - GENERAL

1.1 SOIL REPORTS

- A. Any data on soil and/or subsurface conditions shown in the Plans or Specifications is not to be taken as a representation, but is based on limited information and is at best only an opinion; consequently, such data cannot be considered precise or complete and there is no guarantee as to its completeness, accuracy, or precision.
- B. A limited soils investigation was performed for this project to determine general characteristics of the existing subsurface. Due to limited project budget, the scope was limited and may not have adequately addressed the subsurface conditions in all areas.
- C. Additional Investigation:
 - 1. Contractor should visit the site and acquaint himself with site conditions before submitting a bid, and the submission of a bid will be prima facie evidence that he has done so.
 - 2. Prior to bidding, Contractor may make his own subsurface investigations to satisfy himself with site and subsurface conditions.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 QUALITY ASSURANCE

- A. The Contractor shall readjust work performed that does not meet technical or design requirements.
- B. The Contractor shall make no deviations from the Contract Documents without specific and written approval of the Owner.
- C. The Contractor shall be responsible for obtaining approval from responsible agency or property owner before performing any exploratory excavations.

END OF SECTION 023000

**SECTION 024119
SELECTIVE DEMOLITION**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 WORK INCLUDED

- A. Selective demolition of designated infrastructure, removal of equipment and, disconnecting, reconnecting, and relocation of valves and piping and appurtenant systems to accommodate installing new water treatment equipment, as shown in the Drawings and described in the Specifications.

1.3 DEFINITIONS

- A. Selective Demolition is the removal of existing selected infrastructure from its current location at the Project Site in a manner that does not destroy the items to be removed, nor alter the ability of these items to be reused elsewhere for similar purpose. Selective demolition is to be executed so as not to damage adjacent infrastructure.
- B. Salvage is the transport and storage of items scheduled for demolition.
 - 1. Salvaged items are to be removed using means and methods which do not alter the useful function of the item after removal and storage.
 - 2. Salvaged items are to be transported by the CONTRACTOR to a storage location designated by the OWNER and/or otherwise indicated in these Contract Documents.
 - 3. Salvaged items are to be protected by the CONTRACTOR against damage or loss while storing, handling, and transporting to OWNER.
- C. Disposal is the transport of all items from the project site not scheduled for salvage, and delivery to a waste disposal site permitted to receive the items.

Alternately, at the CONTRACTOR's choosing, items scheduled for disposal may be salvaged by the CONTRACTOR for their own use. The CONTRACTOR's election to salvage items scheduled for disposal shall not require interim storage of those items at the project site nor placement at a location where authority for that purpose has not been granted by the OWNER.

1.3 REGULATORY REQUIREMENTS

- A. Conform to applicable codes for demolition of structure, safety of adjacent

structures, dust control, lead coatings removal, service utilities, discovered hazards, and safety of personnel.

- B. Do not disable or disrupt building fire or life safety systems without prior written notice from the OWNER.
- C. Conform to state and federal procedures upon discovery of hazardous or contaminated materials.

1.4 PRE-DEMOLITION MEETING

- A. Prior to starting any demolition work, conduct a meeting with the OWNER. As a minimum discuss the demolition to be performed; the sequence of activities; temporary systems/unit process shutdown or bypass; operations and duration; items to be retained by OWNER; protection of items to be retained by OWNER; and items to be disposed, and disposal location.

1.5 FIELD CONDITIONS

- A. Owner will occupy portions of the main school building immediately adjacent the selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Owner will not occupy existing shop building for duration of Project.
- C. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- D. Storage or sale of removed items or materials on-site is not permitted.
- E. Utility service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.

1.6 COORDINATION

- A. Arrange selective demolition schedule so as to not interfere with Owner's operation.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition.
- B. Review Project Record Documents of existing construction or other existing conditions provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

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.

3.3 PROTECTION

- A. Protect existing facilities and existing items that are to remain in the area of the Work and are not to be removed or demolished.
- B. Prevent movement or settlement of adjacent structures and foundations. Provide sheeting, shoring, and bracing.
- C. To prevent damage, carefully remove materials and equipment indicated to be salvaged, reused, or relocated. Dispose of all other materials according to approved plan.
- D. Conduct work to minimize interference with adjacent structures, appurtenances, and access.
- E. Maintain egress and access at all times.
- F. Cease work immediately and notify the OWNER if adjacent structures appear to be in danger.

3.4 SELECTIVE DEMOLITION

- A. Demolish and remove components in an orderly and careful manner, per the approved plans.
 - 1. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 - 2. Dispose of demolished items and materials promptly.
- B. Remove appurtenances of items scheduled for demolition when said appurtenance serves no other function or supports no other item or piece of equipment.
- C. Protect existing ancillary facilities and appurtenances.
- D. At penetrations of fire rated wall, partitions, ceilings, roof or floor constructions, completely seal voids with fire rated material to full thickness of the penetrated element. Maintain all fire assembly rating wall or area separation construction in accordance with applicable codes.
- E. Refinish any affected surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project Site.
 - 1. Do not store demolished materials on site.
 - 2. Do not place demolished materials in Owners trash containers.
 - 3. Owner will not allow demolished material to be collected as part of regular trash collection service for the building.
 - 4. Remove and transport debris in a manner that will prevent spillage on adjacent

surfaces and areas.

5. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

B. Burning: Do not burn demolished materials.

3.6 CLEAN UP

A. Leave areas of work in clean condition.

END OF SECTION 024119

**SECTION 033000
CAST IN PLACE CONCRETE**

PART 1 - GENERAL

1.1 STANDARDS AND CODES

- A. ACI (American Concrete Institute) 211.1-89 - Standard Practice for Selecting Proportions for Normal, Heavyweight, or Mass Concrete
- B. ACI 301-89 - Specifications for Structural Concrete for Buildings Reference standards and publications in ACI 301-89 are incorporated in this specification section by reference.
- C. ACI 302.1R-89 Guide for Concrete Floor and Slab Construction
- D. ACI 304R-89 - Recommended practice for measuring, mixing, transporting, and placing concrete
- E. ACI 305R-89 - Hot weather concreting
- F. ACI 306R-88 - Cold weather concreting
- G. ACI 315-80 (rev. 1988) - Details and Detailing of Concrete Reinforcement
- H. ACI 347R-88 - Recommended practice for concrete formwork
- I. ACI SP15(89) - Field Reference Manual
- J. ASTM (American Society for Testing & Material) C131 - Abrasion and Impact of Coarse Aggregate in Los Angeles Machine
- K. ASTM D98 - Calcium Chloride (Accelerating Admixture)
- L. International Building Code - 2012 edition

1.2 SUBMITTALS

- A. Submittals shall include:
 - 1. Project Data:
 - a. The Contractor shall submit, for each class of concrete, mix design data and test documentation as described in ACI 301, Chapter 3, Proportioning.
 - 2. Concrete mix aggregate sieve analysis and Los Angeles wear.
 - 3. Catalog data showing pertinent dimensions and details of forming accessories such as ties and accessories.
 - 4. Catalog data on form materials indicating conformance with specifications.
 - 5. Catalog data on all accessories, joint fillers, sealants, surface treatments, and curing materials.
 - 6. Catalog data on concrete admixtures.

1.3 FIELD REFERENCES

- A. The Contractor shall keep at least one copy of the following references in his or her field office at all times:
1. ACI 301-89 - Specifications for Structural Concrete for Buildings
 2. ACI SP15(89) - Field Reference Manual

1.4 PRECEDENCE OF STANDARDS

- A. In the event of conflicts among these specifications and referenced standards, the more stringent requirements shall apply.

PART 2 – PRODUCTS

2.1 CONCRETE

- A. General: Concrete shall provide not less than the following compressive strength in twenty eight (28) days when Type I cement is used, and in seven (7) days when Type III cement is used. Compressive strength shall be in accordance with ASTM C31 and ASTM C39.

<u>Application</u>	<u>Compressive Strength</u>
Structural Uses	4000 psi
Sidewalks and pavement patches, curb and gutter	3000 psi
Thrust blocks and mass concrete for pipeline encasement	2000 psi

- B. Hydraulic Cement: Concrete shall use Type I or Type III Portland Cement as required by the Drawings and Specifications. Hydraulic cement shall conform to ASTM C 150 "Specifications for Portland Cement" and ASTM C 175 "Specifications for Air entraining Portland Cement."
Cements conforming to Canadian standards substantially the same as ASTM will be acceptable subject to approval by Owner.
- C. Aggregates: Concrete aggregates shall conform to ASTM C33 "Specifications for Concrete Aggregates" except that aggregates which have been shown by special test or actual service to produce concrete of the specified strength and durability may be used if approved by the engineer. Aggregates shall be washed, clean of sticks, roots, clay and deleterious substances prior to use. Coarse aggregate shall be 1 inch minus.
- D. Air entrained concrete: Air entrained concrete shall be used. Either air entrained Portland Cement or an air entrained admixture shall be added at the mixer. The

volume of air in freshly mixed concrete shall be five (5) percent by volume, plus or minus (1) percent. Admixtures may be used only with the approval of Owner.

- E. Cement and Water Content: Cement content and water content shall be determined by the Contractor to meet the strength requirements specified above, except as follows.
- F. Water: Water used in mixing cement shall be clean and free from injurious amounts of oils, acids, alkalies, salts, organic materials or other substances that may be deleterious to concrete or steel.
- G. Water reducing admixtures shall conform to "Specification for Chemical Admixtures for Concrete" (ASTM C 494).
- H. Calcium chloride or other chloride based accelerators shall not be used.

2.2 REINFORCING STEEL

- A. Steel bars: Reinforcing steel shall consist of round deformed bars. Deformed steel bars shall conform to one of the following ASTM Designations.
 - 1 A 615 68 "Standard Specifications for Deformed Billet Steel bars for Concrete Reinforcement," Grade 60.
 - 2 A 616 68 "Standard Specification for Rail Steel Deformed Bars for Concrete Reinforcement," Grade 60.
 - 3 A 617 68 "Standard Specification for Axle Steel Deformed Bars for Concrete Reinforcement," Grade 60.
- B. Welded Wire Fabric: Welded wire fabric used for reinforcement of concrete in pavement restoration shall be minimum AWG No. 6, 6-inch x 6-inch spacing, 75,000 pounds per square inch tensile strength, manufactured in accordance with ASTM Designation A 185.

2.3 ACCESSORIES

- A. Epoxy Adhesive: A two-component compound, 100 percent solids, 100 percent reactive compound suitable for use on dry or damp surfaces. For bonding new concrete to old. "Concresive" Paste (LPL) or (SPL) by Master Builders Inc., or approved equal.
- B. Vapor Barrier: ASTM D2103, 10 mil thick clear polyethylene film.
- C. Form Release Agent: Colorless material which will not stain concrete, absorb moisture, or impair natural bonding or color characteristics of coating intended for use on concrete; Cast Off by Sonneborn.

- D. Anchors: Coupling anchors, if used, shall be DECO Column Anchor and adjustable anchors shall be DECO Standard Anchor. All anchors shall be DECO Manufacturing Co., Decatur, Illinois, or equal.
- E. Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement in place:
 - 1. Use wire bar-type supports complying with CRSI recommendations, unless otherwise indicated. Do not use wood, brick, and other unacceptable materials.
 - 2. For slabs on ground, use supports with sand plates or horizontal runners where base material will not support chair legs.
 - 3. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with either hot-dip galvanized or plastic-protected legs.
- F. Tie Wire: No. 16 American Wire Gauge or heavier, black annealed per ASTM A-82.
- G. Expansion Joints: Expansion joint material shall be closed-cell polyethylene foam with a density of 2.95 pounds per cubic foot. Expansion joint material shall be Sonoflex F by Sonneborn, or equal.
- H. Anchor bolts may be either drilled or cast-in-place, unless otherwise shown on the plans.
 - 1. Drilled anchor bolts shall be Wedge Type expansion anchor, 316 stainless steel, Hilti Type HKB, or approved equal.
 - 2. Drilled drop-in-type female expansion anchors shall be 303 stainless steel, Hilti Type HDI or approved equal.
 - 3. Adjustable anchors for equipment, where used, shall be floating nut-type which will allow at least 1/2-inch movement of the fastening stud. The fastening stud shall be 316 stainless steel. Adjustable anchors shall be DECO Manufacturing Co., Decatur, Illinois, Standard Anchor or equal.

All expansion anchors shall be male-type, projecting anchors unless female-type anchors are specifically called out otherwise.

2.4 CURING MATERIALS

- A. Water: Conform to standards for mixing water, paragraph 2.03C.
- B. Absorptive Mat: Burlap fabric of 9 oz./square yard, clean, roll goods.
- C. Membrane Curing Compound: Conform to requirements of ASTM C309.

2.5 TESTS FOR MIX

- A. Concrete shall be tested for slump by the owner in accordance with ASTM C 143; the maximum permissible slump shall not exceed 4 inches, the minimum slump shall be not less than 2 inches. One slump test will be taken for each truck load.
- B. One entrained air test shall be taken by the owner for each set of test cylinders and at such additional times as may be ordered by the Owner.
- C. Concrete shall develop the compressive strength indicated in this specification. The Owner shall require the testing laboratory to take one set of three test cylinders for each 25 cubic yards of the concrete placed, but not less than one set each day concrete is placed. The Contractor may take more cylinders if desired to demonstrate strength adequate for traffic. Cylinders shall be tested for compressive strength as follows: one lab cured at seven days, two lab cured at 28 days. Making and curing the test cylinders shall conform to ASTM C31, testing to ASTM C39. A copy of all test reports shall be furnished to Contractor.
- D. One additional test cylinder shall be taken during cold weather and shall be cured, on site, under the same conditions as the concrete it represents.
- E. Concrete cylinder test data will be evaluated per Section 1903 of the 2012 International Building Code.
- F. Materials which fail to meet contract requirements, as indicated by laboratory test, shall not be used in the work. The Contractor shall remove all defective material from the site.

PART 3 - EXECUTION

3.1 GENERAL

- A. Unless otherwise specified, execution shall conform with ACI 301 and Chapter 19 of the 2012 International Building Code.

3.2 FORMWORK

- A. Coordination: Coordinate formwork with the work of other trades as required for installation of inserts, conduit pipe sleeves, drains, hangers, supports, anchors, and similar items. Secure in position before concrete is poured.
- B. Installation:
 - 1. General: Construct the forms to meet the tolerances specified in ACI 301. Provide for openings, offsets, chamfers, blocking, and other features required on the work. Provide for easy removal of forms without damage to concrete surfaces. Keep formwork clear of wood chips, clogs, and other deleterious material. Form all concrete surfaces. Earth side walls permitted only with Engineer's approval.

2. Forms: Provide MDO forms for all surfaces exposed to view. The MDO panels shall be attached to the studs, walers, etc., using countersunk, power-driven screws. The countersunk hole shall be filled with putty and sanded smooth.

Provide B Grade, Class 1 plywood forms for all non-exposed surfaces.

Set plywood panels tightly together to prevent loss of concrete mortar. Carefully form intersecting planes to provide true clean-cut corners with edge grain of plywood not exposed as form for concrete. Back joints with extra studs or girts to maintain true, square intersections. Use extra studs, walers, and bracing as required to prevent bowing of forms between studs. Reusable steel forms of approved design may be used for cast-in-place manholes.

3. Form Ties: Provide cone form ties at exposed surfaces. Set ties in straight rows, evenly spaced. Ties shall be water-seal-type with polyethylene washer in the center.
4. Chamfers: Except where 90-degree corners are specifically called out on drawings, at flush joints between concrete and other construction, and as otherwise detailed, provide 3/4-inch triangular wood or plastic strips; place and secure in forms at corners. Horizontal chamfer strips shall be installed with a maximum deviation in elevation of one inch in ten feet.
5. Form Release Agents: Coat contact surfaces of forms with form-coating compound before placing concrete. Apply in strict accordance with manufacturer's instructions, paying special attention to rate and method of application. Ensure that any agent can be disposed prior to coating or is compatible with any required coatings.
6. Deflections: Construct forms with spacing on supports and ties such that they will support the maximum pressure exerted by fluid concrete with an actual deflection not to exceed 1/32-inch, or 0.0025 times the support spacing, whichever is the larger, at the midpoint between supports.
7. Cambers: Design and erect formwork for anticipated deflection due to weight and pressure of fresh concrete as well as structural cambers as noted on drawings. Provide positive means for adjustment of shores and struts to take up settlement during placement.

C. Removal of Forms:

1. Formwork shall be designed for easy removal without damaging or marring finished surfaces of the concrete; take particular care in removing forms from exposed concrete surfaces. Prying against face of concrete will not be

permitted; where mechanical means are necessary to release forms, use wood wedges only, and then only if approved by the Engineer.

2. Do not remove forms and supports until concrete has attained sufficient strength to support anticipated loads.

Use methods of form removal which will not cause overstressing of the concrete. Remove supports to permit the concrete to uniformly and gradually take the stress due to its own weight. Do not use high-impact methods to remove supports.

3. Reshoring: If early form removal is desired, reshore in such manner that at no time will large areas of new construction be required to support their own weight; allow no live loads on new construction until reshored; tighten reshores to take loads, taking care not to overtighten. Leave reshoring in place until concrete has attained 28-day strength.
4. Backfilling: Backfilling and compaction behind walls shall not commence until all walls have been poured and the concrete has reached its required 28-day strength as specified in item 2, above. Mechanical compaction adjacent to walls shall not be allowed within a distance equal to one half the backfill depth. Contractor shall be responsible for any cracking or damage to walls from the mechanical compaction.

- D. Reuse of Forms: Use only forms that will provide surfaces of same quality as specified for original use.

3.3 REINFORCING

A. Handling:

1. Deliver reinforcing steel to the site bundled, tagged, and marked with metal tags indicating bar sizes, lengths, and other information corresponding with markings shown on placement diagrams.
2. Store reinforcement off the ground to prevent damage, excessive rust, dirt, and the like.

B. Placing:

1. General: Conform to applicable portions of reference specifications except as exceeded by provisions of drawings or specifications.
2. Condition: Reinforcement to be free from loose rust, mill scale, ice, and other materials which would reduce or destroy bond.
3. Positioning: Accurately place, support, and secure reinforcement against displacement by formwork construction or concrete placement operations.

Locate and support reinforcing with chairs, runners, bolsters, spacers, and hangers as required.

4. Wire Fabric: Place fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with 16 gauge wire. Offset end laps in adjacent widths.
5. Splices and Reinforcements: Provide standard reinforcement splices by lapping ends, placing bars in contact, and tightly wire tying. Comply with requirements of 2012 International Building Code for minimum lap of spliced bars.

3.4 PLACING CONCRETE - GENERAL REQUIREMENTS

A. Preparation:

1. Before placing concrete, all equipment for mixing and transporting the concrete shall be cleaned, all debris and ice shall be removed from the places to be occupied by the concrete, forms shall be thoroughly wetted (except in freezing weather) or oiled, and masonry filler units that will be in contact with concrete shall be well drenched, and the reinforcement shall be thoroughly cleaned of ice or other coatings. Standing water shall be removed from place of deposit before concrete is placed unless specified or indicated on the drawings.
2. Foundations for footings and grade slabs shall be prepared in accordance with ACI 301 so as to prevent the subgrade from absorbing moisture or cement paste from freshly placed concrete.
3. Inserts and Embedded Items: In cooperation with all trades and other contractors, all inserts and fastening devices such as anchors, hangers, ties, bolts, pipes, conduits, waterstops, nailing strips, etc., shall be properly located and secured in position before concrete is placed. Where pipes pass through the structure, they shall be cast-in-place unless permission is given by the Engineer to do otherwise. Wherever these requirements interfere by the plans, the bars shall be spread and rearranged as directed by the Engineer.
4. Construction Joints: The location of construction joints not shown on the drawings shall be approved by the Engineer. Prior to placing new concrete against any previously poured concrete, the latter shall be roughened by cutting or chipping as required and cleaned of all loose concrete, debris, and laitance, and thoroughly soaked. Horizontal joints shall be covered with a layer of grout 1/2-inch thick before placing new concrete.

At the joints between footings and walls, roughen the footing surface at the joint before placing concrete for walls.

5. Contraction Joints: The location of contraction joints shall be as shown on the plans or as approved by the Engineer.

- B. Concrete Placement: Place concrete within 1-1/2 hours after it is mixed. Once concreting is started, it shall be carried on as a continuous operation until the placing of the panel or section is complete. Suspension of operations for more than 2 hours will not be permitted during a continuous placement, and this limit may be reduced by the Engineer. Flowable concrete may be pumped from the bottom of the form, pumping the full form height without stopping.

Concrete shall be placed generally in horizontal layers no more than 24 inches thick except as otherwise specified. When a monolithic layer cannot be completed in one operation, it shall be terminated with a vertical bulkhead. Feathering to less than 6 inches will not be permitted. Concrete shall be placed so as to avoid segregation of the materials and the displacement of the reinforcement. Where placing operations would involve the dropping of concrete through completed forms from heights of 6 or more feet for plain concrete and 4 or more feet through installed reinforcement, concrete so placed shall be discharged into hoppers feeding into flexible drop chutes. Encrustation of installed reinforcement by concrete spilled on it will be tolerated only for a length of time shorter than the encrusting concrete needs for drying out. Where conditions warrant, this procedure may be altered by the Engineer upon request of the Contractor.

C. Consolidation

1. Concrete shall be thoroughly consolidated by the proper use of immersion-type vibrators as specified in ACI 301.
2. Pumps may be used only if they can pump the mix designed. Do not add fine aggregate or water to the mix to satisfy the needs of a pumping device.

D. Cold and Hot Weather Placement:

1. Cold Weather Placing: Comply with ACI 306R to protect all concrete work from physical damage and reduced strength caused by frost, freezing actions, or low temperatures. Place no concrete against frozen earth.

The concrete may be placed at 40°F (4°C) and below down to 20°F (-7°C), ambient temperature, without heating the mix and maintaining the noted protection if the specified "Freeze Protection Admixture" is added to the mix at 60 to 90 oz. per 100 pounds of cement per manufacturer's instructions. The ambient temperature must be 20°F (-7°C) or higher until initial set is reached and the hardened concrete has been sealed to prevent the ingress of additional water.

2. Hot Weather Placing: Cool ingredients before mixing as necessary to maintain concrete temperature at time of placement below 80°F (32°C). Mixing water may be chilled, or chopped ice may be used to control temperature provided the water in the ice is used as part of the mix water and included in calculating the water/cement ratio. Follow the requirements

of ACI 305R in producing and placing concrete in ambient temperatures over 80°F (27°C).

The specified second-generation superplasticizer may be used in place of cooling for concrete with concrete temperatures 80°F (27°C) and over. Work with the ready-mix producer and admixture manufacturer to make a mix using a second-generation plasticizer to control the concrete temperature rise.

During dry, windy weather, erect windbreaks and/or sunshades and protect the concrete surface immediately after placing and leveling using either a fog spray or the specified Hot Weather Finishing Aid, during the entire finishing operation, until curing is applied.

END OF SECTION 033000

**SECTION 061000
ROUGH CARPENTRY**

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Insulation: Section 072116.
- B. Painting: Section 099123.

1.2 QUALITY ASSURANCE

- A. Grading rules of the following shall apply for lumber and plywood:
 - 1. West Coast Lumber Inspection Bureau (WCLIB).
 - 2. Western Wood Products Association (WWPA).
 - 3. Softwood Plywood - Construction and Industrial: Product Standard PS-1.
 - 4. Hardwood Plywood - Product Standard PS-51.
 - 5. Finish Carpentry and Cabinets - Quality Standards of the Architectural Woodwork Institute (AWI).
 - 6. AWPB - American Wood Preservers Bureau.
 - 7. FS - Federal Specifications.

- B. Grade Marks: Identify all lumber and plywood by official grade mark:
 - 1. Lumber grading rules and wood species conform to voluntary Product Standard PS-20.
 - 2. Lumber grade stamp (except finish millwork and trim). Symbol of grading agency, mill number or name, grade of lumber, species or species grouping or combination designation, rules under which graded, and condition of seasoning at time of manufacture.
 - a.S-GRN: Unseasoned
 - b.S-Dry: Maximum 19% moisture content
 - c.MC-15 or KD: Maximum of 15% moisture content
 - d.Dense.
 - 3. Softwood Plywood: Appropriate grade trademark of the American Plywood Association.
 - a.Type, grade, class, and Identification Index.
 - b.Inspection and testing agency mark.
 - 4. Hardwood Plywood: Appropriate grade mark of qualified inspection, testing, or grading agency.

- C. Testing: ASTM E 84 maximum 25 flame spread rating.

- D. Requirements of Regulatory Agencies:
 - 1. Fire Hazard Classification: Underwriter's Laboratories, Inc., for treated lumber and plywood.

2. Preservative Treated Lumber and Plywood: American Wood Preservers Bureau, Quality Mark.
3. Pressure Treated Material: American Wood Preservers Bureau Standards.
4. Span Tables: National Forest Products Association.
5. Working Stresses: Softwood Lumber, National Design Specification, National Forest Products Association.
6. Construction: Conform to the International Building Code.

1.3 SUBMITTALS

- A. Shop Drawings: Submit shop drawings indicating framing connection details, fastener connections, and dimensions, pattern of plywood.
- B. Certification:
 1. Pressure Treated Wood: Submit certification by treating plant stating chemicals and process used, net amount of salts retained, and conformance with applicable standards.
 2. Preservation Treated Wood: Submit certification for waterborne preservative that moisture content was reduced to 19% maximum, after treatment.
 3. Fire-retardant Treatment: Submit certification by treating plant that fire-retardant treatment materials comply with governing ordinances and that treatment will not bleed through finished surfaces.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Immediately upon delivery to job site, place materials in area protected from weather.
- B. Store materials a minimum of 6 inches above ground on framework or blocking and cover with protective waterproof covering providing for adequate air circulation or ventilation.
- C. Do not store seasoned materials in wet or damp portions of building.
- D. Protect fire-retardant materials against high humidity and moisture during storage and erection.
- E. Protect sheet material surfaces and corners while unloading.

PART 2 - PRODUCTS

2.1 LUMBER

- A. Dimensions
 1. Specified lumber dimensions are nominal.

2. Actual dimensions conform to industry standards established by the American Lumber Standards Committee and the rules writing agencies.
- B. Moisture Content
1. Unseasoned or 19% maximum at time of permanent closing in of building or structure, for lumber 2 inches or less nominal thickness.
 2. All finish lumber must be kiln-dried to an average moisture content range as follows:
 - Exterior Work - 9% to 12%
 - Interior Work - 6% to 11%
- C. Grade shall be as indicated below unless stated otherwise on the Drawings.
1. General framing, studs, plates, blocking, furring, braces and nailers shall be Standard and Better or Stud Grade.
 2. Structural joists and planks, 2" to 4" thick x 5" and wider and headers shall be Douglas Fir Coast Region No. 1, FB = 1500 psi minimum.
 3. Beams, stringers, posts, and timbers shall be Douglas Fir Coast Region No. 1 or Larch No. 1.
 4. Interior trim shall be Douglas Fir, C Select Grade, or AWI Custom Grade.

2.2 PLYWOOD

- A. All plywood exterior grade DFPA C-C or better. All knots plugged in surfaces exposed to view.
- B. Thicknesses as tabulated on Drawings but not less than:
1. 1/2" for roof sheathing
 2. 3/8" for wall sheathing
 3. 5/8" for subflooring
 4. 1/4" for underlayment

2.4 PRESERVATIVE TREATED WOOD PRODUCTS

- A. Waterborne salt preservatives for painted, stained, or exposed natural wood product:
1. AWPB LP-2, above ground application.
 2. AWPB LP-22, ground contact application.
 3. Lumber redried to maximum moisture content of 19% stamped "DRY".
 4. AWPB LP-44, ground contact application, volatile petroleum solvent.
 5. AWPB LP-7, above ground application, heavy petroleum solvent - penta solution for outdoor applications exposed to weather where painting is not required.
 6. AWPB LP-77, ground contact application, heavy petroleum solvent - penta solution.
- B. Creosote and creosote preservatives for wood placed in ground or in water:
1. AWPB LP-5, above ground application, creosote or creosote coal tar

- solutions.
2. AWPB LP-55, ground contact application, creosote or creosote coal tar solution.

2.5 ROUGH HARDWARE

- A. Bolts:
 - 1.FS FF-B-575.
 - 2.FS FF-B-584.
- B. Nuts: FS FF-N-836.
- C. Expansion Shields: FS FF-S-325.
- D. Lag Screws and Bolts: FS FF-B-561.
- E. Toggle Bolts: FS FF-B-588.
- F. Wood Screws: FS FF-S-111.
- G. Nails and Staples: FS FF-N-105.
- H. Metal Nailing Discs:
 1. Flat caps, minimum 1 inch diameter
 2. Minimum 30 ga. sheet metal.
 3. Formed to prevent dishing.
 4. Bell or cub shapes not acceptable.
- H. Joist Hangers, and Framing Anchors: Type as noted on Drawings. Zinc-coated steel. Timber Engineering Co., Simpson, or equivalent.
- J. Provide all fasteners and miscellaneous hardware required for assembly and anchoring finish woodwork.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Verify that surfaces to receive rough carpentry materials are prepared to exact grades and dimensions.

3.2 INSTALLATION

- A. Sills: Secure sills with ½" x 8 in. minimum size anchor bolts embedded in the structure minimum of 6 in. spaced maximum of 4 ft. o.c.
- B. Posts and Columns: Erect posts straight, plumb with straight edge and level, and

brace with tack boards at plate and sill.

C. Stud Framing:

1. Plates and Stud Members:
 - a. Provide single bottom plate and double top plates, 2 inches thick by width of studs.
 - b. Overlap double top plate at corners and intersections. Lower member of double top plate shall be spliced over a stud.
 - c. Anchor bottom plate to concrete structure with anchor bolts, expansion sleeves and lag bolts, or power driven studs, spaced 4 ft. o.c.
 - d. Triple studs at corners and partition intersections.
 - e. Anchor studs abutting masonry or concrete with ½" anchor bolts, maximum spacing of 4 ft. o.c.
 - f. Partition parallel to floor joists below: Locate joists directly below studs.
 - g. Frame Openings:
 - (1) Double studs and headers: openings less than 4 feet.
 - (2) Triple studs and headers: openings 4 feet and greater unless otherwise shown.
2. Headers: See plans.
3. Blocking: Install on all single story partitions over 8 feet high and multi-story partitions.
4. Corner Bracing: Run continuous bracing member diagonally from intersection of post and girt to point on sill approximately 4 feet away, or three stud spaces.

D. Joist Framing:

1. Install with crown edge up.
2. Support ends of each member minimum 1½" of bearing on wood or metal.
3. Support ends of each member minimum 3 in. of bearing on masonry.
4. Laterally support joists alternately at ends with solid blocking 2 inches thick by depth of joists, between members crossing bearing point.
5. Lap members framing from opposite sides of beams, girders, or partitions, minimum 4 in. over support.
6. Provide solid blocking between joists under door posts.
7. Notches:
 - a. Do not notch in middle third of joists.
 - b. Notches in top or bottom of joists: Maximum of 1/8 depth of member.
 - c. Notched ends: Maximum of ¼ depth of member.
8. Bored holes: Maximum 1/3 depth of member, 2 in. minimum distance to top or bottom of joists.
9. Bridging: Nominal depth-to-thickness ratio of joists exceeding 6, install bridging at 8 ft. intervals.

- E. Rafters:
1. Double rafters at opening in roof framing to provide headers and trimmers, and support with metal hangers.
 2. At ridge, place rafters directly opposite each other and nail to ridge member or support with metal hangers.
 3. Locate collar beams at every third pair of rafters, one-third distance to ceiling joists.
- F. Beams and Girders:
1. Install with crown edge up.
 2. Nail built-up beams or girders with two rows of 20d nails spaced maximum of 2 ft. 8 in. o.c., locating one row near top edge and other near bottom edge of member.
 3. Beams or girders framed into pockets of exterior concrete or masonry walls: Provide minimum of 1 in. air space between sides and ends of wood members and concrete or masonry wall. Preservative treat as specified.
- G. Miscellaneous Framing:
1. Firestops:
 - a. Stud Walls: 2 in. thick x depth of member blocking at each floor level and top story ceiling level.
 - b. Floor and Ceiling Framing: 2 in. thick x depth of wood member blocking, fitted to fill openings from one space to another to prevent drafts.
 - c. Chimneys and Fireplaces: Keep wood framing minimum of 2 in. from outside face of masonry and 4 in. from fireplace back wall.
 - d. At all other locations required by UBC provisions.
 2. Framing for Mechanical Work:
 - a. Frame members for passage of pipes and ducts to avoid cutting structural members.
 - b. Do not cut, notch, or bore framing members for passage of pipes or conduits without concurrence of Engineer.
- H. Wood Decking:
1. Frame members for passage of pipes and ducts to avoid cutting structural members.
 2. Toenail groove to tongue at a maximum of 30 in. on centers.
- I. Roof Sheathing (unless otherwise noted):
1. Install plywood with face grain perpendicular to supports, using panel with continuous end joints over two or more spans staggered between panels and located over supports.
 2. Allow minimum space of 1/8 in. between end joints and ¼ in. between edge joints for expansion and contraction of panels.
- J. Wall Sheathing (unless otherwise noted):
1. Install plywood with face grain horizontal or vertical.

2. Allow minimum 1/8 in. space at end joints and 1/4 in. at edge joints.
- K. Subflooring:
1. Install with face grain perpendicular to joists; end joints occurring over the joists.
 2. Allow 1/16 in. space at end joints and 1/8 in. at edge joints. Stagger panel end joints.
- L. Gypsum Sheathing:
1. Apply square edge sheathing with long dimension parallel with supports.
 2. Sides and edges abut vertical framing members, top and bottom plates or headers.
 3. Attach sheathing using nails spaced at 8 inch o.c. at all edges of sheet and 8 inch o.c. on intermediate support.
 4. Joint treatment with U.S. Gypsum Co. Perf-A-Tape system or equivalent.
 5. Protect exposed corners with U.S. Gypsum Co. Perf-A-Bead or equivalent molding embedded in joint compound per manufacturer's recommendations.
 6. Finish sand all areas to smooth, even surfaces suitable for painting.
- M. Pressure Treated Wood:
1. Provide pressure-treated wood for all framing, blocking, furring, nailing strips built into exterior masonry walls, wood in contact with concrete and in conjunction with gravel stops and built-up roofing.
 2. Re-dry and clean lumber, after treatment, to maximum moisture content of 19% stamped "DRY".
 3. Apply two brush coats of same preservative used in original treatment to all sawed or cut surfaces of treated lumber.
- N. Cabinets:
1. Fabricate cabinet units with laminated plastic over plywood on exposed faces. Conform to AWI Quality Standards, Premium Grade, reveal overlay design, for units shown on Drawings.
 2. Assemble units as far as possible in shop for field installation.
 3. Install units plumb and level, without distortion. Adjust doors and drawers for smooth operation. Provide self edged plastic laminate counter top with 4-inch back and side splash.
 4. Follow manufacturer's instructions for installation of hardware items. Make all work neat and secure, developing full strength of components and providing intended function.

3.3 NAILING SCHEDULE

- A. Nailing shall conform to the schedule in the latest edition of the International Building Code.

END OF SECTION 061000

**SECTION 072100
THERMAL INSULATION**

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Extruded polystyrene foam-plastic board insulation.
2. Glass-fiber blanket insulation.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Extruded polystyrene foam-plastic board insulation.
2. Glass-fiber blanket insulation.

1.3 INFORMATIONAL SUBMITTALS

- A. Installer's Certification: Listing type, manufacturer, and R-value of insulation installed in each element of the building thermal envelope.
- B. Product test and research reports.

PART 2 - PRODUCTS

2.1 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD INSULATION

A. Extruded Polystyrene Board Insulation, Type V: ASTM C578, Type V, 100-psi minimum compressive strength.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Dow Chemical Company (The).
 - b. DuPont de Nemours, Inc.
 - c. Owens Corning.
2. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
3. Smoke-Developed Index: Not more than 450 when tested in accordance with

ASTM E84.

4. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

2.2 GLASS-FIBER BLANKET INSULATION

- A. Glass-Fiber Blanket Insulation, Unfaced: ASTM C665, Type I; passing ASTM E136 for combustion characteristics.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Insulation.
 - b. Johns Manville; a Berkshire Hathaway company.
 - c. Knauf Insulation.
 - d. Owens Corning.
2. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
3. Smoke-Developed Index: Not more than 50 when tested in accordance with ASTM E84.
4. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

2.3 ACCESSORIES

- A. Insulation for Miscellaneous Voids:
 1. Glass-Fiber Insulation: ASTM C764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E84.
 2. Spray Polyurethane Foam Insulation: ASTM C1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E84.
- B. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.
- C. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide ventilation between insulated attic spaces and vented eaves.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Install insulation with manufacturer's R-value label exposed after insulation is installed.
- D. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- E. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.2 INSTALLATION OF SLAB INSULATION

- A. On vertical slab edge and foundation surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.

3.3 INSTALLATION OF FOUNDATION WALL INSULATION

- A. Butt panels together for tight fit.
- B. Adhesive Installation: Install with adhesive or press into tacky waterproofing or dampproofing according to manufacturer's written instructions.

3.4 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. 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. For wood-framed construction, install blankets according to ASTM C1320.
- B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft.
 2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

END OF SECTION 072100

**SECTION 072500
WEATHER BARRIERS**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Water resistant barrier (WRB).
 2. Flexible flashing.
 3. Prefabricated flashing panels.

1.2 ACTION SUBMITTALS

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

1.3 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For breathable air and water-resistive barrier and flexible flashing, from ICC-ES.

PART 2 - PRODUCTS

2.1 WATER-RESISTIVE BARRIER

- A. Building Wrap:
1. Basis for Design Product: VaproShield “WallShield IT” Integrated Tape mechanically attached sheet membrane and accessories for rain screen building enclosures.
 2. ASTM E 1677, Type I Breathable air barrier; with flame-spread and smoke-developed indexes of less than 25 and 100, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.
 3. Water-Vapor Permeance: Not less than 142 g through 1 sq. m of surface in 24 hours per ASTM E398 per E 96- Wet Cup Method (Procedure B).
 4. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
- B. Building Wrap: Primary water-resistive weather barrier membrane components and accessories must be obtained as a single-source to ensure total system compatibility and integrity.

- C. Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

2.2 MISCELLANEOUS MATERIALS

- A. Butyl Rubber, Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.030 inch.
- B. Prefabricated Flashing Panels: Polyethylene plastic or thermoplastic rubber flashing panels for penetrations. Basis for Design Product: "Quickflash Waterproofing Products" flashing panels for waterproofing of exterior vertical wall penetrations.

PART 3 - EXECUTION

3.1 WATER-RESISTIVE BARRIER INSTALLATION

- A. Cover sheathing with breathable air and water-resistive barrier as follows:
 - 1. Apply barrier to cover vertical flashing with a minimum 4-inch overlap unless otherwise indicated.
- B. Building Wrap- Water Resistant Barrier: Comply with manufacturer's written instructions.
 - 1. Seal seams, edges, fasteners, and penetrations with tape.
 - 2. Extend into jambs of openings and seal corners with tape.

3.2 FLEXIBLE FLASHING INSTALLATION

- A. Apply flexible flashing where indicated to comply with manufacturer's written instructions.
 - 1. 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.
 - 2. Lap flashing over water-resistive barrier at bottom and sides of openings.
 - 3. Lap water-resistive barrier over flashing at heads of openings.

3.3 PREFABRICATED FLASHING PANEL INSTALLATION

- A. Apply prefabricated flashing panels at all penetrations where residing occurs and where indicated. Comply with manufacturer's written instructions.

END OF SECTION 072500

**STANDING-SEAM METAL ROOF PANELS
SECTION 074113.16**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Direct fastener standing-seam metal roof panels.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
- C. Samples: For each type of metal panel indicated.

1.3 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Warranties: Sample of special warranties.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
 - 1. 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 panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Finish Warranty Period: 20 years from date of Substantial Completion.
- C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Energy Performance: Provide roof panels that are listed on the EPA/DOE's ENERGY STAR "Roof Product List" for low-slope roof products.
- B. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E1592:
 1. Wind Loads and Other Design Loads: As indicated on Drawings.
- C. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E1680 at the following test-pressure difference:
 1. Test-Pressure Difference: 6.24 lbf/sq. ft.
- D. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E1646[or ASTM E331] at the following test-pressure difference:
 1. Test-Pressure Difference: 6.24 lbf/sq. ft.
- E. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E2140.
- F. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated per structural.
- G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

2.2 STANDING-SEAM METAL ROOF PANELS- DIRECT FASTENER

- A. Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and directly attaching panels to substrates with concealed fasteners. Include clips, cleats, and accessories required for weathertight installation.
 1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E1514.
- B. Vertical-Rib, Snap-Joint, Standing-Seam Metal Roof Panels to match existing roofing panels: Formed with vertical ribs at panel edges and a flat pan between ribs; designed for sequential installation by directly attaching panels to substrate using concealed fasteners located under one side of panels.
 1. Basis of Design: ASC Building Products "Skyline Roofing hp" Standing Seam Metal

Roofing System, 24 ga., 16" panel with two-coat fluoropolymer with color to match roof at existing building.

2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A653/A653M, G90 coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A792/A792M, Class AZ50 coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
 - a. Nominal Thickness: 0.028 inch.
 - b. Exterior Finish: Two-coat fluoropolymer.
 - c. Color: As selected by Architect from manufacturer's full range to match existing roof.
3. Panel Coverage: 16 inches.
4. Panel Height: 1.5 inches.

2.3 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.
 1. Thermal Stability: Stable after testing at 240 deg F; ASTM D1970.
 2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F; ASTM D1970.
- B. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.

2.4 MISCELLANEOUS MATERIALS

- A. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fascia, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
 1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch-thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- B. Flashing and Trim: Provide flashing and trim formed from same material as metal panels 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 metal panels.
- C. Panel Fasteners: Self-tapping screws designed to withstand design loads.
- D. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with

panel materials, are nonstaining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing; 1/2 inch wide and 1/8 inch thick.
2. Joint Sealant: ASTM C920; as recommended in writing by metal panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

2.5 SNOW GUARDS

1. Snow Guards: Provide ASC Building Products "Snow Break" bar-type metal snow guards with spacing per roofing manufacturer. Color to match roofing panels.

2.6 FABRICATION

- A. Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Provide panel profile to match existing metal roofing to remain. Include major ribs and intermediate stiffening ribs, if any, for full length of panel.
- C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

2.7 FINISHES

- A. Panels and Accessories:
 1. Two-Coat Fluoropolymer: AAMA 621 or AAMA 2605. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat.
 2. Concealed Finish: White or light-colored acrylic or polyester backer finish.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and metal panel manufacturer's written recommendations.

3.2 INSTALLATION OF UNDERLAYMENT

- A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with

temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated below and on Drawings, wrinkle free, in shingle fashion to shed water, and 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.

1. Apply over the roof area indicated below:
 - a. Roof perimeter for a distance up from eaves of 36 inches beyond interior wall line.
 - b. Valleys, from lowest point to highest point, for a distance on each side of 18 inches. Overlap ends of sheets not less than 6 inches.
 - c. Rake edges for a distance of 18 inches.
 - d. Hips and ridges for a distance on each side of 18 inches.
 - e. Roof-to-wall intersections for a distance from wall of 18 inches.
 - f. Around chimneys, skylights, and other penetrating elements for a distance from element of 24 inches.

B. Underlayment: Apply at locations indicated below, in shingle fashion to shed water, and with lapped joints of not less than 2 inches.

1. Apply over the entire roof surface.

C. Slip Sheet: Apply slip sheet over underlayment before installing metal roof panels.

D. Flashings: Install flashings to cover underlayment to comply with requirements specified in Section 076200 "Sheet Metal Flashing and Trim."

3.3 INSTALLATION OF STANDING SEAM METAL ROOF PANELS

A. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.

1. Watertight Installation:

- a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommend in writing by manufacturer as needed to make panels watertight.
- b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
- c. At panel splices, nest panels with minimum 6-inch end lap, sealed with sealant and fastened together by interlocking clamping plates.

B. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

C. 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.

3.4 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

END OF SECTION 074113.16

**SECTION 074213.13
FORMED METAL WALL PANELS**

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exposed-fastener, lap-seam metal wall panels.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
- C. Samples: For each type of metal panel indicated.

1.3 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Warranties: Samples of special warranties.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
 - 1. 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 panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E1592:
 - 1. Wind and Other Design Loads: As indicated on Drawings.
- B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E283 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 6.24 lbf/sq. ft.
- C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E331 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 6.24 lbf/sq. ft.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

2.2 EXPOSED-FASTENER, LAP-SEAM METAL WALL PANELS

- A. Provide factory-formed metal panels designed to be field assembled by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed

fasteners in side laps. Include accessories required for weathertight installation.

- B. Corrugated-Profile, Exposed-Fastener Metal Wall Panels: Formed with alternating curved ribs spaced at 2.67 inches o.c. across width of panel.
1. Basis for Design: AEP Span “Nu-Wave” Exposed Fastener Corrugated Metal Wall Panels.
 2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A653/A653M, G90 coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A792/A792M, Class AZ50 coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
 - a. Nominal Thickness: 0.028 inch.
 - b. Exterior Finish: Two-coat fluoropolymer.
 - c. Color: As selected by Architect from manufacturer's full range- minimum 10 colors.
 3. Rib Spacing: 2.67 inches o.c.
 4. Panel Coverage: 32 inches.
 5. Panel Height: 0.5 inch.

2.3 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C645, cold-formed, metallic-coated steel sheet, ASTM A653/A653M, G90 coating designation or ASTM A792/A792M, Class AZ50 aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.
- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal panels.
 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations

include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

- D. Panel Fasteners: Self-tapping screws designed to withstand design loads noted on structural drawings. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.
- E. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
 - 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing; 1/2 inch wide and 1/8 inch thick.
 - 2. Joint Sealant: ASTM C920; as recommended in writing by metal panel manufacturer.
 - 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

2.4 FABRICATION

- A. Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.
- C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

2.5 FINISHES

- A. Panels and Accessories:

1. Two-Coat Fluoropolymer: Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat.
2. Concealed Finish: White or light-colored acrylic or polyester backer finish.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and metal panel manufacturer's written recommendations.

3.2 INSTALLATION

- A. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.
 1. Lap ribbed or fluted sheets one full rib. Apply panels and associated items true to line for neat and weathertight enclosure.
 2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.
 3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
 4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
 5. Flash and seal panels with weather closures at perimeter of all openings.
- B. Watertight Installation:
 1. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting- type panels; and elsewhere as needed to make panels watertight.
 2. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
 3. At panel splices, nest panels with minimum 6-inch end lap, sealed with sealant and fastened together by interlocking clamping plates.
- C. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
- D. 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 are permanently watertight.

3.3 CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

END OF SECTION 074213.13

METAL SOFFIT PANELS
SECTION 074293

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes aluminum soffit panels.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
- B. Shop Drawings:
 - 1. Include fabrication and installation layouts of metal panels including perforated and solid components; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
 - 2. Accessories: Include details of flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches.
- C. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.
 - 1. Include similar Samples of trim and accessories involving color selection.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranties: For special warranties.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal panels during installation.

1.5 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.6 COORDINATION

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

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including rupturing, cracking, or puncturing.
 - b. Deterioration of metals and other materials beyond normal weathering.
 - 2. 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 panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 METAL SOFFIT PANELS

- A. General: Provide metal soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.

- B. V-Groove-Profile Metal Soffit Panels: Solid and Perforated panels formed with vertical panel edges and intermediate stiffening ribs symmetrically spaced between panel edges; with a V-groove joint between panels.
 - 1. Manufacturer: Same as metal roof panels.
 - 2. Material: Same material, finish, and color as metal roof panels.

 - 3. Aluminum Sheet: Coil-coated sheet, ASTM B 209, alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.
 - a. Thickness: 0.032 inch.
 - b. Surface: Smooth, flat finish.
 - c. Exterior Finish: Two-coat fluoropolymer.
 - d. Color: As selected by Owner from manufacturer's full range.

 - 4. Panel Coverage: manufacturer's standard
 - 5. Panel Height: manufacturer's standard.

2.2 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 coating designation or ASTM A 792/A 792M, Class AZ50 aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
 - 1. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch-thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

- C. Flashing and Trim: Provide panning flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Finish flashing and trim with same finish system as adjacent metal panels.
- D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.
- E. Panel Sealants: Provide sealant types recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
 - 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
 - 2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
 - 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.3 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
 - 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 sealant and 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 recommended in writing by metal panel manufacturer.
 - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal soffit panel manufacturer for application but not less than thickness of metal being secured.

2.4 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. 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 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.
- C. Aluminum Panels and Accessories:
 1. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
 1. Examine framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal panel manufacturer.
 2. Examine sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal panel manufacturer.

- a. Verify that air- or water-resistive barriers been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.
 1. Soffit Framing: Provide as required for installation.

3.3 METAL PANEL INSTALLATION

- A. Layout: Install perforated and solid panels as per approved shop drawings.
- B. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 1. Shim or otherwise plumb substrates receiving metal panels.
 2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
 3. Install screw fasteners in predrilled holes.
 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 5. Install flashing and trim as metal panel work proceeds.
 6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 7. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
 8. Aluminum Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
- C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.
- D. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.

1. Apply panels and associated items true to line for neat and weathertight enclosure.
2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.
3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.

E. Watertight Installation:

1. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting-type panels and elsewhere as needed to make panels watertight.
2. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
3. At panel splices, nest panels with minimum 6-inch end lap, sealed with sealant and fastened together by interlocking clamping plates.

F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel system including trim, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.

G. Flashing, panning 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 are permanently watertight.

1. Install exposed flashing, fascia panning and trim that is without 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 achieve waterproof 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 expansion provisions cannot be used or would not be waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.4 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
- B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074293

SECTION 076200
SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. Aluminum Association (AA):
 - a. 35-80, Specifications for Aluminum Sheet Metal Work in Building Construction.
 - b. 45-80, Designation System for Aluminum Finishes.
 2. American Society for Testing and Materials (ASTM):
 - a. A153-95, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - b. A167-91, Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip (R 1994).
 - c. A653/A653M-95, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.
 - d. B32-89, Standard Specification for Solder Metal (R 1995).
 - e. B209-90, Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate.
 - f. B370-88, Standard Specification for Copper Sheet and Strip for Building Construction (R 1995).
 - g. D1187-95, Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.
 - h. D4586-93, Standard Specification for Asphalt Roof Cement, Asbestos-Free.
 3. Federal Specifications (FS): QQ-L-201F(2), Lead Sheet (11/17/70).
 4. Sheet Metal and Air Conditioning Contractors National Association (SMACNA): Architectural Sheet Metal Manual, 5th Edition, 1993.

1.2 SUBMITTALS

- A. Shop Drawings:
1. Show joints, types and location of fasteners, and special shapes.
 2. Catalog data for stock manufactured items.
- B. Samples: Color samples for items to be factory finished.

1.3 DELIVERY, HANDLING, AND STORAGE

- A. Package and protect during shipment.
- B. Inspect for damage, dampness, and wet storage stains upon delivery to the Work site.

- C. Remove and replace damaged or permanently stained materials that cannot be restored to like-new condition.
- D. Carefully handle to avoid damage to surfaces, edges, and ends.
- E. Do not open packages until ready for use.
- F. Store materials in dry, weathertight, ventilated areas until immediately before installation.

PART 2 - PRODUCTS

2.1 METAL

- A. Galvanized Sheet Steel: ASTM A525-93 and ASTM A526-90, G90, commercial quality copper bearing steel, thickness 0.0217-inch (26 U.S. Standard gauge), unless otherwise shown.

2.2 DOWNSPOUTS, GUTTERS, SCUPPERS, AND CONDUCTOR HEADS

- A. By metal building manufacturer.
 - 1. Gutter color to match trim.
 - 2. Downspout color to match siding.

2.3 ANCILLARY MATERIALS

- A. Solder: ASTM B32-89, alloy composition Sn 50.
- B. Soldering Flux: ASTM B32-89, Type RA.
- C. Sealer Tape: Polyisobutylene sealer tape.
- D. Isolation Tape: Butyl or polyisobutylene, internally reinforced, or 20-mil thick minimum polyester.
- E. Fasteners: For Galvanized Steelwork: Steel, galvanized per ASTM A153-95 or stainless steel fasteners.

2.4 FABRICATION OF FLASHING

- A. Field measure prior to fabrication.
- B. Fabricate in accordance with SMACNA Architectural Sheet Metal Manual.
- C. Accurately form flashings to shapes shown and detailed, with angles and lines in true alignment.
- D. Form arris and angles true to line and surfaces free of waves and buckles.
- E. Form bends to 1/16-inch inside radius.

- F. Hem exposed edges.
- G. Reinforcements and Supports: Provide same material as flashing unless other material is shown. Steel, where shown or required, shall be galvanized or stainless.
- H. Rigid Joints and Seams: Make mechanically strong. Solder galvanized and stainless steel metal joints. Do not use solder to transmit stress.
- I. Fabricate sheet metal in 10-foot maximum lengths, unless otherwise indicated.
- J. At exposed ends of counterflashing furnish weathertight closures.
- K. Fabricate corners in one-piece with legs extending 30 inches each way to field joint. Lap, rivet, and solder corner seams watertight.
- L. Neutralize soldering flux.
- M. Solvent clean sheet metal. Surfaces to be in contact with roofing or otherwise concealed shall be coated with isolation paint.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Flashing:
 1. Coordinate flashing Work with roofing Work for weathertight and watertight assembly.
 2. Isolate metal from wood and concrete and from dissimilar metal with isolation tape or two coats of isolation paint.
 3. Use only stainless steel fasteners to connect isolated dissimilar metals.
 4. Joints: 10-foot maximum spacing and 2-1/2 feet from corners, butted with 3/16-inch space centered over matching 8-inch long backing plate with sealer tape in laps.
 5. Set flanges of flashings and roof accessories on continuous sealer tape or in plastic roof cement on top of envelope ply of roofing. Nail flanges through sealer tape and at 3-inch maximum spacing. Touch up isolation paint on flanges.
 6. Joints, Fastenings, Reinforcements, and Supports: Sized and located as required to preclude distortion or displacement due to thermal expansion and contraction.
 7. Provide continuous holddown clips at counterflashing.
 8. Conceal fastenings wherever possible.
 9. Set flashing and sheet metal to straight, true lines with exposed faces aligned in proper plane without bulges or waves.
- B. Prefabricated Systems:
 1. Follow system manufacturer's applicable printed instructions.
 2. Place color variations in pieces so no extremes are next to each other.

3.2 FINISH

- A. Exposed Surfaces of Flashing and Sheet Metalwork: Free of dents, scratches, abrasions, or other visible defects, and clean and ready for painting where applicable. Color and finish to match adjacent siding, roofing, or trim.

END OF SECTION 076200

**SECTION 079200
JOINT SEALANTS**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Silicone joint sealants.
 - 2. Nonstaining silicone joint sealants.
 - 3. Urethane joint sealants.
 - 4. Mildew-resistant joint sealants.
 - 5. Butyl joint sealants.

1.2 ACTION SUBMITTALS

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

1.3 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Sample warranties.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

1.5 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant

- manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.6 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.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following:
 1. Architectural sealants shall have a VOC content of 250 g/L or less.
 2. Sealants and sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.
 3. Sealants and sealant primers for nonporous substrates shall have a VOC content of 775 g/L or less.
- C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range to match adjacent materials.

2.2 SILICONE JOINT SEALANTS

- A. Silicone, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
 - a. Dow Corning Corporation.
 - b. Tremco Incorporated.

2.3 NONSTAINING SILICONE JOINT SEALANTS

- A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C

1248.

- B. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.
 - a. Dow Corning Corporation.
 - b. Tremco Incorporated.

2.4 URETHANE JOINT SEALANTS

- A. Urethane, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T and NT.
 - a. BASF Corporation.
 - b. Pecora Corporation.

2.5 MILDEW-RESISTANT JOINT SEALANTS

- A. 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 C 920, Type S, Grade NS, Class 25, Use NT.
 - a. Dow Corning Corporation.
 - b. Tremco Incorporated.

2.6 JOINT-SEALANT BACKING

- A. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- B. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer.

2.7 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials.

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 prior experience.

INSTALLATION OF JOINT SEALANTS

- C. General: Comply with ASTM C 1193 and joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- D. 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.
- E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- F. 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.
- G. 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. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.

3.2 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
 - 1. Joint Locations:
 - a. Joints between metal panels.
 - b. Perimeter joints between materials listed above and frames of doors, windows and louvers.
 - c. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors to match adjacent materials.

- B. Joint-Sealant Application: Exterior joints in vertical and horizontal traffic and nontraffic surfaces.
 - 1. Joint Locations:
 - a. Joints between concrete and metal.
 - b. Perimeter joints between materials listed above and frames of doors, windows and louvers.
 - 2. Joint Sealant: Urethane, S, P, 25, T, NT.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors to match adjacent materials.

- C. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement.
 - 1. Joint Locations:
 - a. Control joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints between interior wall surfaces and frames of doors and windows.
 - 2. Joint Sealant: Acrylic latex.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors to match adjacent materials.

END OF SECTION 079200

**SECTION 081113
HOLLOW METAL DOORS AND FRAMES**

PART 1 - GENERAL

1.1 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American National Standards Institute (ANSI):
 - a. A156.1-88, Butts and Hinges (BHMA 101).
 - b. A156.2-89, Bored and Preassembled Locks & Latches (BHMA 601).
 - c. A156.4-92, Door Controls-Closers (BHMA 301).
 - d. A156.16-89, Auxiliary Hardware (BHMA 1201).
 - e. A156.18-93, Materials and Finishes (BHMA 1301).
2. American Society for Testing and Materials (ASTM):
 - a. A366-95, Standard Specification for Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality.
 - b. E774-92, Standard Specification for Sealed Insulating Glass Units.
3. Steel Door Institute (SDI):
 - a. 100-91, Recommended Specifications, Standard Steel Doors and Frames.
 - b. 105-92, Recommended Erection Instructions for Steel Frames.
 - c. 107-84, Hardware on Steel Doors (Reinforcement-Application).

1.2 SUBMITTALS

A. Shop Drawings:

1. Showing door and frame construction and anchorage details.
2. Complete Hardware Schedule, including numbers and finishes.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Provide packaging such as cardboard or other containers, separation, banding, and wrappings.
- B. Store doors upright, inside, at least 1 inch off floor.

1.4 MAINTENANCE

- A. Special Tools: Provide one set of those required for installation, maintenance, or adjustment.

PART 2 - PRODUCTS

1.1 DOOR AND FRAME MATERIALS

- B. Sheet Steel for Doors and Frames: Cold-rolled, stretcher level sheet, ASTM A366-95.
- C. Ancillary Items: Manufacturer's standard core filler, anchors, and fasteners.
- D. Glazing:
 - 1. Tempered Insulating Glass (T.I.G.): Clear tempered insulating glass with 1/2-inch air space meeting requirements of ASTM E774-92, Test Grade C, warranted for 5 years.
 - 2. Ancillary materials as required.

1.2 HARDWARE MATERIALS

- E. General:
 - 1. Furnish finish hardware with suitable stainless steel fasteners for a complete installation.
 - 2. Products complete and of equal quality and finish.
- F. Bolts: ANSI A156.16-89.

Type	Item	ANSI/BHMA	Stanley	Lawrence
B1	Top & Bottom Surface	L04151	CD4060	283

- G. Butt Hinges: ANSI A156.1-88.

Type	Item	ANSI/BHMA	Stanley	McKinney
H1	Regular, ball bearing	A2112	FBB191	TB2314

- H. Locks and Latches: ANSI A156.2-89 or A156.13-94, keying on schedule; furnish with lever handles, two keys for each lock and two master keys.

Type	Item	ANSI/BHMA	Schlage Rhodes	Sargent LL
L1	Entrance lock	F109	D53PD	7G05
L2	Storeroom lock	F86	D80PD	10G04

- I. Closers: ANSI A156.4-92 with painted finish.

Type	Item	ANSI/BHMA	LCN	Sargent
C1	Regular arm	C02011	4010	350

- J. Stops: ANSI A156.16-89.

Type	Item	ANSI/BHMA	Builder's Brass	Baldwin
S1	Floor stops	L02131	F121X	4086
S2	Wall bumper	L02251	WC9X	4031

- K. Thresholds:

Type	Item	ANSI/BHMA	Pemco	Reese
T1	Saddle	--	175A	S104A

- L. Weatherstripping:

Type	Item	ANSI/BHMA	Pemco	Reese
W1	Head and jamb Door shoe Rain drip	--	S88D 222AV 346C	797B DB596AF R201C

- M. Finishes: ANSI A156.18-93, satin chromium-plated No. 626, unless indicated otherwise.

- N. Nameplates: Beveled edge plastic plate, 1/8-inch thick, 2-inch high black, with 1-inch high white Helvetica letters and matching sign with International Symbol of Accessibility.

1.5 DOOR AND FRAME FABRICATION

- A. Hollow Metal Doors and Frames: Meet requirements of SDI 100-91 and SDI 107-84.

- B. Hollow Metal Doors:

1. Type A: Insulated 1-3/4-inch thick, flush panel with 24-inch by 30-inch glass.
2. Type B: Insulated 1-3/4-inch thick, flush panel with 5-inch by 24-inch glass.

3. Type C: Non-Insulated, 1 3/4 inches thick, flush panel.
4. Type D: non-Insulated, 1-3/4-inch thick, flush panel with 24-inch by 24-inch louver.
5. Flush end closure on top.
6. Furnish overlapping astragal on active leaf of pairs of doors.
7. Rust-inhibiting prime coating over ASTM A653/A653M A60 or G60 zinc coating.
8. Exterior: SDI Grade III, Model 1, 16-gauge.
9. Interior: SDI Grade II, Model 1, 18-gauge.

C. Hollow Metal Frames:

1. Exterior Doors to be Welder type.
2. Interior doors to be Knockdown or Welded type.
3. Exterior Frame Thickness: 14-gauge.
4. Interior Frame Thickness: 16-gauge.

PART 3 EXECUTION

1.1 PREPARATION

- D. Coordinate doors, frames, and hardware.
- E. Provide hardware templates as required to door and frame manufacturers.

1.2 FRAME AND DOOR INSTALLATION

- F. Frames: Plumb and square, in accordance with SDI 105-92 and manufacturer's recommendations, and secure to adjacent construction.
- G. Doors: SDI 100-91.
- H. Remove labels from glass, wash and polish both faces.
- I. Leave clean and undamaged.
- J. Touch up prime coating.

1.3 HARDWARE INSTALLATION

- K. Mounting Dimensions: Follow National Builder's Hardware Association Standard; lock and latch backset 2-3/4 inches.
- L. Follow manufacturer's instructions. Make Work neat and secure, developing full strength of components and providing intended function.
- M. Prevent marring, scratching, or otherwise damaging adjacent finishes during installation.

- N. Set stops over solid backing after painting is complete.
- O. Cope ends of thresholds neatly to jamb profile and set in sealant, anchoring securely.
- P. Do fitting, dismantling, and reinstalling of finish hardware required before and after painting.
- Q. After installation, adjust hardware for noise-free operation without resistance.

1.4 PROTECTION

- A. Protect doors, frames, and hardware from damage after installation.

1.6 SUPPLEMENTS

- A. The supplements listed below, following “END OF SECTION”, are part of this Specification.
 - 1. Door and Hardware Schedule: See construction drawings.
 - 2. Hardware Sets: Guide to functional requirements of each opening. Provide hardware complete. Size omitted shall be as recommended by the manufacturer.

Item	Type
HDW-1. Single Locked Storeroom Door	
1-1/2 Pair butts, 4-1/2 by 4-1/2	H1
1 Lock	L2
1 Threshold	T1
1 Set weatherstrip	W1
HDW-2. Single Locked Entrance Door	
1-1/2 Pair butts, 4-1/2 by 4-1/2	H1
1 Lock	L1
1 Threshold	T1
1 Closer	C1
1 Set weatherstrip	W1
HDW-3. Double Doors, with Lock	
3 Pair butts, 4-1/2 by 4-1/2	H2
1 Lock	L1
1 Threshold	T1
2 Surface bolts	B1
1 Set weather strip (door)	W1

**OVERHEAD COILING DOORS
SECTION 083323**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Springless insulated rolling service doors.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type and size of overhead coiling door and accessory.
1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
 3. Include description of automatic-closing device and testing and resetting instructions.
- B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.
1. Include plans, elevations, sections, and mounting details.
 2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
 3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
 4. For exterior components, include details of provisions for assembly expansion and contraction and for excluding and draining moisture to the exterior.
 5. Show locations of controls, locking devices, detectors or replaceable fusible links, and other accessories.
 6. Include diagrams for power, signal, and control wiring.
- C. Samples for Selection and Verification: For each type of exposed finish on the following components, in manufacturer's standard sizes:
1. Curtain slats.

2. Bottom bar with sensor edge.
3. Guides.
4. Brackets.
5. Hood.
6. Locking device(s).

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For overhead coiling doors to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.

1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of doors that fail in materials or workmanship within specified warranty period.
 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain overhead coiling doors from single source from single manufacturer.
 1. Obtain operators and controls from overhead coiling-door manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance, Exterior Doors: Capable of withstanding the following design wind loads:
 - 1. Design Wind Load: As indicated on Structural Drawings.
 - 2. Testing: According to ASTM E 330/E 330M.
 - 3. Deflection Limits: Design overhead coiling doors to withstand design wind load without evidencing permanent deformation or disengagement of door components.
 - 4. Operability under Wind Load: Design overhead coiling doors to remain operable under design wind load, acting inward and outward.

- B. Seismic Performance: Overhead coiling doors shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 as noted on plans.

2.3 DOOR ASSEMBLY

- A. Insulated Springless Rolling Service Door: Overhead coiling door formed with curtain of interlocking metal slats.
 - 1. Basis for Design: Overhead Door Corporation Everserve Model 625S Insulated Springless Rolling Service Door with Stormtite perimeter seal, steel guides and powder coat finish, vision lites where noted.

- B. Operation Cycles: Door components and operators capable of operating for not less than 500,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.
 - 1. Include tamperproof cycle counter.

- C. Air Infiltration: Maximum rate of < 1.0 cfm/sq. ft. at 15 and 25 mph when tested according to ASHRAE 90.1 and IECC 2012/2015 C402.4.3.

- D. STC Rating: 28.

- E. Curtain R-Value: 7.7 R-Value, U-Value: 0.13

- F. Door Curtain Material: 24 gauge powder coated steel.

- G. Door Curtain Slats: Flat profile slats of 1-7/8-inch center-to-center height.
 - 1. Vision Panels: Approximately 10- by 1-5/8-inch openings spaced approximately 2 inches apart and beginning 12 inches from end guides; in three rows of slats at height indicated on Drawings; installed with insulated vision-panel glazing.

2. Insulated-Slat Interior Facing: Metal.
 3. Gasket Seal. Manufacturer's standard continuous gaskets between slats.
- H. Bottom Bar: Two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch thick; fabricated from hot-dip galvanized steel and finished to match door .
- I. Curtain Jamb Guides: Galvanized steel with exposed finish matching curtain slats.
- J. Locking Devices: Equip door with locking device assembly.
1. Locking Device Assembly: Cremone-type, both jamb sides locking bars, operable from inside and outside with cylinders.
- K. Manual Door Operator: Chain-hoist operator or Manufacturer's standard crank operator.
1. Provide operator with manufacturer's standard removable operating arm.
- L. Electric Door Operator:
1. Usage Classification: Standard duty, up to 25 cycles per hour and up to 90 cycles per day.
 2. Operator Location: Wall.
 3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 feet or lower.
 4. Motor Exposure: Interior.
 5. Motor Electrical Characteristics:
 - a. Horsepower: 1 hp.
 - b. Voltage: 208-V ac, three phase, 60 Hz.
 6. Emergency Manual Operation: Chain type.
 7. Obstruction-Detection Device: Automatic photoelectric sensor.
 8. Control Station(s): Interior mounted.
 9. Other Equipment: Audible and visual signals.
- M. Curtain Accessories: Equip door with weatherseals, push/pull handles and automatic-closing device.
- N. Door Finish:
1. Powder-Coated Finish: Color to be selected from manufacturer's standard colors.
 2. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

2.4 MATERIALS, GENERAL

- 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.

2.5 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
 - 1. Steel Door Curtain Slats: Zinc-coated (galvanized), cold-rolled structural- steel sheet; complying with ASTM A 653/A 653M, with G90 zinc coating; nominal sheet thickness (coated) of 0.028 inch; and as required.
 - 2. Vision-Panel Glazing: Manufacturer's standard clear glazing, fabricated from transparent acrylic sheet or fire-protection-rated glass as required for type of door; set in glazing channel secured to curtain slats.
 - 3. Insulation: Fill slats for insulated doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke- developed indexes of 75 and 450, respectively, according to ASTM E 84 or UL 723. Enclose insulation completely within slat faces.
 - 4. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face, with minimum steel thickness of 0.010 inch.
- B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain, and a continuous bar for holding windlocks.

2.6 LOCKING DEVICES

- A. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.7 CURTAIN ACCESSORIES

- A. Weatherseals for Exterior Doors: Equip each exterior door with weather- stripping gaskets fitted to entire exterior perimeter of door for a weather- resistant installation unless otherwise indicated.
 - 1. At door head, use 1/8-inch- thick, replaceable, continuous-sheet baffle secured to inside of hood or field-installed on the header.
 - 2. At door jambs, use replaceable, adjustable, continuous, flexible, 1/8-inch- thick seals of flexible vinyl, rubber, or neoprene.
- B. Push/Pull Handles: Equip each push-up-operated or emergency-operated door with lifting handles on each side of door, finished to match door.

2.8 ELECTRIC DOOR OPERATORS

- A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear- reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
 - 1. Comply with NFPA 70.
 - 2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc.
- B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.
- C. Door Operator Location(s): Operator location indicated for each door.
 - 1. Wall Mounted: Operator is mounted to the inside front wall on the right side of door and connected to door drive shaft with drive chain and sprockets. Side room is required for this type of mounting.
- D. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated for each door assembly.
 - 1. Electrical Characteristics: Minimum as indicated for each door assembly. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.

2. Operating Controls, Controllers, Disconnect Switches, Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
 3. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.
- E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.
- F. Obstruction-Detection Devices: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening. For non-fire-rated doors, activation of device immediately stops and reverses downward door travel.
1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.
 - a. Self-Monitoring Type: Designed to interface with door operator control circuit to detect damage to or disconnection of sensing device. When self-monitoring feature is activated, door closes only with sustained or constant pressure on close button.
- G. Control Station: Three-button control station in fixed location with momentary- contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure push-button control labeled "Close."
1. Interior-Mounted Units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
- H. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf.
- I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

2.9 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.
- 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.

2.10 STEEL AND GALVANIZED-STEEL FINISHES

- A. Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Accessibility: Install overhead coiling doors, switches, and controls along accessible routes in compliance with the accessibility standard.
- C. Power-Operated Doors: Install automatic garage doors openers according to UL 325.

3.3 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.
 - 2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.
 - 3. Test door closing when activated by detector or alarm-connected automatic-closing system. Reset door-closing mechanism after successful test.

3.4 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion and weather resistance.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.

3.5 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include twelve months' full maintenance by skilled employees of coiling-door Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION 083323

DOOR HARDWARE
SECTION 087100

PART 1 - GENERAL

1.1 SUMMARY:

- A. Section Includes: Finish Hardware for door openings, except as otherwise specified herein.
 - 1. Door hardware for steel doors.
 - 2. Keyed cylinders as indicated.

- B. 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 specified and are required for completion of the Work, a written statement of such discrepancy 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 SUBMITTALS:

- A. Product Data: Manufacturer's specifications and technical data including the following:
 - 1. Detailed specification of construction and fabrication.
 - 1. Manufacturer's installation instructions.
 - 2. Submit digital copy of catalog cuts with hardware schedule.

- B. Shop Drawings - Hardware Schedule: Submit copy of detailed hardware schedule in digital format.
 - 1. Hardware group and suffixes in proper sequence.
 - 2. Manufacturer, product name, and catalog number for each item.
 - 3. Function, type, and style.
 - 4. Size and finish of each item.
 - 5. Mounting heights.

- C. 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.

1.3 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. Installer's Qualifications: Firm with 3 years experience in installation of similar hardware to that required for this Project.
 - 4. Single Source Responsibility: Except where allowed, furnish products of only one manufacturer for each type of hardware.

- B. Review Project for extent of finish hardware required completing 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.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Packing and Shipping: Comply with Division 1
 - 1. Deliver products in original unopened packaging with legible manufacturer's identification.

- B. Storage and Protection: Comply with manufacturer's recommendations.

1.5 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.

- C. Verify new hardware will accommodate conditions if existing.

1.6 WARRANTY:

- A. Manufacturer's Warranty:
 - 1. Closers: Ten years
 - 2. Exit Devices: Three Years
 - 3. Locksets & Cylinders: Three years
 - 4. All other Hardware: Two years.

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	Hager, McKinney
Locksets & Cylinders	Best	No Substitution
Pulls	Trimco	Rockwood, Hager
Stops	Trimco	Rockwood, Hager
Flatgoods	Trimco	Rockwood, Hager
Thresholds & Gasketing	Pemko	National Guard

2.2 MATERIALS:

- A. Hinges:
1. Template screw hole locations
 2. Minimum of 2 permanently lubricated non-detachable bearings
 3. Equip with easily seated, non-rising pins
 4. Sufficient size to allow 180-degree swing of door
 5. Furnish hinges with five knuckles and flush bearings
 6. Provide hinge type as listed in schedule.
 7. Furnish 3 hinges per leaf to 7 foot 6 inch height. Add one for each additional 30 inches in height or fraction thereof.
 8. Tested and approved by BHMA for all applicable ANSI Standards for type, size, function and finish
- B. Medium Duty Cylindrical Type Locks and Latchsets:
1. Tested and approved by BHMA for ANSI A156.2, Series 4000, Operational Grade 2, and be UL listed
 2. Fit modified ANSI A115.2 door preparation
 3. Locksets and cores to be of the same manufacturer to maintain complete lockset warranty
 4. Locks to have solid shank with no opening for access to keyed lever keeper.
 5. Each lever to have independent spring mechanism controlling it
 6. 2-3/4 inch backset
 7. 1/2 inch throw latchbolt
 8. Keyed lever to be removable only after core is removed, by authorized control key

9. Provide locksets with 7-pin removable and interchangeable core cylinders
 10. Core face must be the same finish as the lockset
 11. Function and design as indicated in the hardware groups
- C. Cylinders:
1. Provide necessary cylinder housings, collars, rings, & springs as recommended by manufacturer for proper installation.
 1. Provide proper cylinder cams as required to operate locksets.
 2. Coordinate and provide as required for related sections.
- D. Kick plates: Provide with four beveled edges, height as specified by width less 2 inches on single doors and 1 inch on pairs of doors. Furnish pan- head countersunk screws to match finish.
- E. 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.
- F. Thresholds: As specified and per details. Maximum height of ½” at ADA required openings. Coordinate with door bottom and door undercut.

2.3 FINISH:

- A. Designations used in Schedule of Finish Hardware - 3.5, 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

2.4 KEYS AND KEYING:

- A. Provide keyed 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:
1. Per Owner or Best “Standard” small format 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".

- E. Furnish keys in the following quantities:
 - 1 each Control keys
 - 2 each Masterkeys
 - 3 each Change keys each keyed core

- 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, Owner and other involved parties to ensure locksets and locking hardware, are functionally correct and keying complies with project requirements.

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.

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).

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. Locksets: Provide appropriate backset to center lockset. Install strikes with back boxes.

- C. Thresholds: Set thresholds for exterior doors in full bed of sealant complying with requirements. Securely and permanently anchor exterior thresholds using countersunk non-ferrous screws to match color of threshold. Stainless steel screws at aluminum thresholds.

D. Gaskets & Weatherstripping: Install jamb-applied gaskets, rim strikes, etc; fasten hardware over and through stop applied gaskets providing an uninterrupted seal where possible. Install sweeps across bottoms of doors before astragals, cope sweeps around bottom pivots, trim astragals to tops of sweeps.

a. Adjustments: Adjust and check each operating item of door hardware and each door to ensure proper operation of function of every unit. Replace units that cannot be adjusted to operate as intended.

3.4 FIELD QUALITY CONTROL AND FINAL ADJUSTMENT:

A. Contractor/Installer Field Services: After installation is complete, Contractor shall inspect completed door openings on site to verify installation of hardware is complete and properly adjusted. Check latchset, lockset, and exit devices are properly installed and adjusted to ensure proper operation.

3.5 SCHEDULE OF FINISH HARDWARE:

A. Manufacturer's Abbreviations:

1. ST Stanley
2. BE Best
3. PE Pemko
4. TR Trimco
5. PR Precision
6. SCH Schlage
7. Von D Von Duprin

Note: Coiling Door to have Manufacturers Standard Hardware. See specifications.

END OF SECTION 087100

SECTION 092900 GYPSUM BOARD

PART 1 - GENERAL

1.1 QUALITY ASSURANCE

- A. General: Regardless of the minimum specifications herein, utilize materials and applications recommended by the manufacturer.
- B. Applicator's Qualifications: Use only workers regularly employed in this type of work who can show experience in the application of similar materials and the specific systems specified.

1.2 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver fire-rated materials bearing testing agency label and required fire classification numbers.
- B. Storage:
 - 1. Store materials inside, under cover, stacked flat, off floor.
 - 2. Stack gypsum board so that long lengths are not over short lengths.
 - 3. Avoid overloading floor system of storage area.
 - 4. Store adhesives and finishing compounds in dry areas; protect against freezing at all times.

1.3 ENVIRONMENTAL CONDITIONS

- A. Temperature:
 - 1. In areas receiving gypsum board installation, maintain temperature range between 55 and 70 degrees F for 24 hours before, during, and after gypsum board and joint treatment application.
 - 2. In areas receiving veneer plaster, where outside air temperature is less than 50 degrees F, maintain interior temperature range between 50 degrees F and 80 degrees F for a period of 1 week before, during, and 1 week after application of veneer plaster, base, and joint treatment.
- B. Ventilation:
 - 1. Provide ventilation during and following adhesives and joint treatment applications.
 - 2. Use temporary air circulators in enclosed areas lacking natural ventilation.

3. Keep air circulation at a minimum level during veneer plastering to avoid excessive drying.
4. Under slow drying conditions, allow additional drying time between coats of joint treatment.
5. Protect installed materials from drafts of ambient air during hot, dry weather.

PART 2 - PRODUCTS

2.1 GYPSUM BOARD

- A. Regular Board (GWB): ASTM C36-91, 5/8-inch thick with tapered edges, unless noted otherwise on Drawings.
- B. Fire-Rated Board (GWBX): ASTM C36-91, Type X, 5/8-inch thick with tapered edges.
- C. Water-Resistant Board (WRB): ASTM C630-91, Type X, 5/8-inch thick with tapered edges.
- D. Gypsum Backing Board (GGB): ASTM C442-91, with water-resistant face paper, designed for shaft wall systems use, 1-inch thick, edges tapered and rounded or beveled.

2.2 FASTENERS FOR GYPSUM BOARD

- A. Screws: ASTM C1002-88, self-drilling, self-tapping, bugle head, for use with power-driven tool.
 1. Type S, 1-inch long for gypsum board to sheet metal.
 2. Type W, 1-1/4 inches long for gypsum board to wood.

2.3 JOINT TREATMENT MATERIALS

- A. Joint Tape for General Interior Applications: ASTM C475-89, perforated tape.
- B. Joint Compound for General Interior Applications: ASTM C475-89, all-purpose, ready-mixed compound.
- C. Joint Compound for Water-Resistant and Soffit Boards: Chemically curing, polyindurate type material as recommended by the manufacturer.
- D. Joint Tape for Soffit Board: 2-inch wide 10 by 10 glass mesh tape.

2.4 ANCILLARY MATERIALS

- A. Adhesives: As recommended by gypsum board manufacturer for intended use.

- B. Sound Attenuation Blankets: ASTM C665-88, Type I (no facing), as required to fill cavity.
- C. Acoustical Sealant: Nonsetting and nonstaining as manufactured by DAP, United States Gypsum, Tremco, or Ohio Sealants, Inc.

2.5 METAL ACCESSORIES

- A. ASTM C1047-85, Zinc-Coated Metal.
 - 1. Corner Bead: 1-1/4-inch by 1-1/4-inch:
 - a. United States Gypsum; Dur-A-Bead.
 - b. Gold Bond; standard corner beads.
 - 2. Edge Trim:
 - a. United States Gypsum; 200B metal trim.
 - b. Gold Bond; No. 200 casing bead.
 - 3. Metal Control Joint:
 - a. United States Gypsum; No. 093.
 - b. Gold Bond; E-Z strip control joint.

2.6 LIGHT-GAUGE METAL FRAMING

- A. Carrying Channels: Cold-rolled steel, 16-gauge, free of rust, coated with factory-applied rust-inhibitive paint, 1-1/2 inches deep, weighing not less than 475 pounds per 1,000 linear feet.
- B. Furring Channels: Roll-formed hat shaped section of 25-gauge galvanized steel with a face width of 1-3/8 inches and a depth of 7/8-inch.
- C. Resilient Furring Channels: Roll-formed section of 25-gauge galvanized steel with face width of 1-1/2 inches designed for resilient attachment of gypsum board to framing.
 - 1. Manufacturers and Products:
 - a. United States Gypsum; RC-1 channel.
 - b. Donn Corp.; DG-8 resilient channels.

2.7 NONSTRUCTURAL METAL FRAMING MEMBERS

- A. ASTM C645-88, 25-gauge and 20-gauge galvanized C-studs with 1-5/8-inch flanges, and ancillary items for interior wall framing.
- B. Dry wall studs, tracks, and accessories as manufactured by:
 - 1. United States Gypsum.
 - 2. Inryco-Milcor.
 - 3. Gold Bond.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Inspect surfaces to receive gypsum board and related materials before beginning work and report to ENGINEER any defects in such work which will adversely affect the quality of work specified herein.

3.2 PREPARATION

- A. General: Provide, install, and maintain necessary scaffold, staging, trestles, planking, and temporary heating, lighting, and ventilation as necessary for the duration of the gypsum board work.
- B. Protection: Protect work of other trades.
- C. Coordination:
 - 1. Coordinate work with that of other trades. Check specifications and drawings of other trades to determine parts of work requiring coordination.
 - 2. Cut and repair gypsum board systems for installation of omitted work.
- D. Surface Preparation: Repair *defective* surfaces prior to starting work. Prepare as specified for application of specific materials.

3.3 ERECTION OF LIGHT-GAUGE NONSTRUCTURAL METAL FRAMING

- A. Layout: Align partitions as shown on the Drawings.
- B. Tracks:
 - 1. Attach metal runner tracks to floor slabs with suitable fasteners located 2 inches from each end and spaced not more than 24 inches OC.
 - 2. Attach tracks to suspended ceiling with toggle or molly bolts spaced 24 inches OC.
- C. Studs:
 - 1. ASTM C754-88.
 - 2. Following manufacturer's printed instructions, position studs vertically, engaging floor and ceiling tracks and spaced as noted on Drawings.
 - 3. Splice: When necessary, use 8-inch nested lap and one positive attachment per stud flange.
 - 4. Place in direct contact with doorframe jambs, abutting partitions, and partition corners. Provide for anchorage of doorframes to studs.

5. Anchor all studs for shelf-walls and those adjacent to window and doorframes, partition intersections, and corners to ceiling and floor runner flanges. Securely anchor studs to jamb and head anchor clips of door or borrowed-light frames by bolt or screw attachment.
6. Over metal door and borrowed-light frames, place horizontally a cut-to-length section of runner, with a web-flanged bend at each end, and secure with one positive attachment per flange. Position a cut-to-length stud (extending to ceiling runner) at vertical panel joints over doorframe header.
7. Locate studs at abutting construction, partition intersections, and partition corners.
8. Spacing: At 24 inches OC, unless otherwise required by manufacturer.
9. At Doorframes and Cased Openings:
 - a. Full height double studs, No. 20-gauge minimum, secured to jamb anchors by bolts, screws, or welds.
 - b. Header Track: Secure to frame head anchors and double studs.
 - c. Provide double channel stiffeners through studs above frame and extend at least one stud space beyond each jamb.
10. Windows: Similar framing to door openings with stiffeners both above and below.
11. Wall Mounting Accessories: Provide channels, horizontal studding, No. 16-gauge sheet 8 inches by 2 inches greater than stud spacing, or other members within walls as required to provide secure and adequate support.

D. Furring:

1. Space furring channels the same as studs or as shown.
2. Around columns and beams construct furring as shown using metal studs and furring channels securely tied together and anchored in-place.
3. Attach resilient furring channels to wood framing with screws.

3.4 APPLICATION OF GYPSUM BOARD

A. Inspection and Preparation:

1. Check framing for accurate spacing and alignment.
2. Verify that spacing of installed framing does not exceed maximum allowable for thickness of gypsum board to be used.
3. Verify that frames are set for thickness of gypsum board to be used.
4. Do not proceed with installation of gypsum board until deficiencies are corrected and surfaces to receive gypsum board are acceptable.
5. Protrusions of framing, twisted framing members, or unaligned members must be repaired before installation of gypsum board is started.

B. General:

1. Meet requirements of ASTM C840-88 and GA-216-93.
2. Joints: Use gypsum board of maximum lengths to minimize end joints. Stagger end joints when they occur. Locate end joints as far as possible from center of wall or ceiling. Abut gypsum board without forcing. Neatly fit ends and edges of gypsum board. Do not place butt ends against tapered edges.
3. Support ends and edges of gypsum board panels on framing or furring members except for face layer of double layer and where ends are back blocked and floated.
4. Use metal edge trim where gypsum board abuts another material and where shown or noted on Drawings.
5. Use water-resistant board in restroom and janitor room walls.
6. Follow manufacturer's recommendation of good practice.

C. Over Framing:

1. Apply gypsum board first to ceiling and then to walls for single layer horizontal application.
2. Use vertical application for fire-rated walls.
3. Fasten gypsum board securely to framing using double screw method.

- D. Fireproofing: Install fireproofing of columns, beams, and shaft walls as shown.

3.5 JOINT SYSTEM

- A. Interior Gypsum Board: Conform to ASTM C840-88.
- B. Required: On exposed gypsum board, behind casework.
- C. Prefill: Fill V-grooves formed by abutting rounded edges of gypsum board with prefill joint compound. Fill V-joint flush and remove excess compound beyond groove. Leave clear depression to receive tape. Permit prefill joint compound to harden prior to application of tape.
- D. Taping and Finishing Joints:
 - 1. Taping or Embedding Coat: Apply compound in thin, uniform layer to joints and angles to be reinforced. Apply reinforcing tape immediately. Center tape over joint and seat tape into compound. Leave approximately 1/64-inch to 1/32-inch compound under tape to provide bond. Apply skim coat immediately following tape embedment but not to function as fill or second coat. Fold tape and embed in angles to provide true angle. Dry embedding coat prior to application of fill coat.
 - 2. Filling Coat: Apply joint compound over embedding coat. Fill taper flush with surface. Apply fill coat to cover tape. Feather out fill coat beyond tape and previous joint compound line. For joints with no taper, feather out at least 4 inches on either side of tape. Do not apply fill coat on interior angles. Allow fill coat to dry prior to application of finish coat.
 - 3. Finishing Coat: Spread joint compound evenly over and beyond fill coat on joints. Feather to smooth uniform finish. Apply finish coat to taped angles to cover tape and taping compound. Sand final application of compound to provide surface ready for decoration.
 - 4. Filling and Finishing Depressions: Apply joint compound as first coat to fastener depressions. Apply at least two additional coats of compound after first coat is dry. Leave filled and finished depressions level with plane of surface.
- E. Finishing Beads and Trim:
 - 1. First Fill Coat: Apply joint compound to bead and trim. Feather out from ground to plane of the surface. Dry compound prior to application of second fill coat.
 - 2. Second Fill Coat: Apply joint compound in same manner as first fill coat. Extend beyond first coat onto face of gypsum board. Dry compound prior to application of finish coat.

3. Finish Coat: Apply joint compound to bead and trim. Extend beyond second fill coat. Feather finish coat from ground to plane of surface. Sand finish coat to provide flat surface ready for decoration.

3.6 FINAL FINISHES

- A. Levels of Finish: Conform to GA-214-93.
- B. Level 1:
 1. Taping or embedding coat only.
 2. Use in concealed areas, and where indicated, unless a higher level is required for fire-resistive or sound-rated assemblies.
- C. Level 3:
 1. Taping, filling, and finishing coats.
 2. Use on surfaces indicated to have spray texture or ceramic tile.
- D. Level 4:
 1. Taping, filling, and finishing coats plus two separate coats applied over joints, angles, fastener heads, and trim accessories.
 2. Sand between coats and after last coat.
 3. Use on surfaces indicated to receive wall coverings.
- E. Level 5:
 1. Same as Level 4, plus a thin, smooth, uniform skim coat of joint compound, or product specially formulated for this purpose, over entire surface.
 2. Produce surfaces free of tool marks and ridges, ready for decoration.
 3. Use on surfaces not indicated otherwise, those indicated to receive gloss, semi-gloss, and nontextured flat paints, and where indicated.

3.7 ADJUST AND CLEAN

- A. Clean: Remove droppings or texture overspray from walls, windows, and floor, leaving room clean for following trades.
- B. Nail Pop: Repair nail pop by driving new nail approximately 1-1/2 inches from nail pop and reseal nail. When face paper is punctured, drive new nail or screw approximately 1-1/2 inches from *defective* fastening and remove *defective* fastening. Fill damaged surface with compound.
- C. Ridging:

1. Do not repair ridging until condition has fully developed, approximately 6 months after installation or one heating season.
 - a. Sand ridges to reinforcing tape without cutting through tape.
 - b. Fill concave areas on both sides of ridge with topping compound.
 - c. After fill is dry, blend in topping compound over repaired area.
2. Fill cracks with compound and finish smooth and flush.

END OF SECTION 092900

**SECTION 099123
INTERIOR PAINTING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following interior substrates:

- 1. Gypsum board.

1.3 ACTION SUBMITTALS

- A. Product List: For each product indicated, include the following:
 - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Handling: Deliver products to Project site in an undamaged condition in manufacturer's original sealed containers, complete with labels and instructions for handling, storing, unpacking, protecting, and installing. Packaging shall bear the manufacturer's label with the following information:
 - 1. Product name and type (description).
 - 2. Batch date.
 - 3. Color number.
 - 4. VOC content.
 - 5. Environmental handling requirements.
 - 6. Surface preparation requirements.
 - 7. Application instructions.
- B. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.5 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
- C. Lead Paint: It is not expected that lead paint will be encountered in the Work.
 - 1. If suspected lead paint is encountered, do not disturb; immediately notify Architect and Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Sherwin-Williams Company (The); products indicated or comparable product from one of the following:
 - 1. Benjamin Moore & Co.
 - 2. PPG Architectural Coatings.
 - 3. Pratt & Lambert.
 - 4. Valspar Corporation - Architectural (Pro).
- B. Source Limitations: Obtain paint materials from single source from single listed manufacturer.
 - 1. Manufacturer's designations listed on a separate color schedule are for color reference only and do not indicate prior approval.

2.2 PAINT, GENERAL

- A. Material Compatibility:
 - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

2.3 SOURCE QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers. Where acceptability of substrate conditions is in question, apply samples and perform in-situ testing to verify compatibility, adhesion, and film integrity of new paint application.
 1. Report, in writing, conditions that may affect application, appearance, or performance of paint.
- B. Substrate Conditions:
 1. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - a. Gypsum Board: 12 percent.
 2. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- C. Proceed with coating application only after unsatisfactory conditions have been corrected; application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or

weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
 2. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
1. Use applicators and techniques suited for paint and substrate indicated.
 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 3. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 4. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
1. Contractor shall touch up and restore painted surfaces damaged by testing.

2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

A. Gypsum Board Substrates:

1. Latex System:

a. Prime Coat: Primer, latex, interior:

- 1) S-W ProMar 200 Zero VOC Latex Primer, B28W2600, at 4.0 mils wet, 1.0 mils dry.

b. Intermediate Coat: Latex, interior, matching topcoat.

c. Topcoat: Latex, interior, flat:

- 1) S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series, at 4.0 mils wet, 1.6 mils dry, per coat.

d. Topcoat: Latex, interior, eggshell:

- 1) S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series, at 4.0 mils wet, 1.7 mils dry, per coat.

END OF SECTION 099123

**SECTION 133419
METAL BUILDING SYSTEMS**

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Work Included: The extent and location of the Pre-engineered Metal Building addition as indicated on the drawings. The work includes the requirements for providing all structural steel for the pre-engineered steel building; secondary members; roof and wall sheeting; bolts and fasteners; painting of structural, secondary, and roof and wall sheeting; bracing; gutters, downspouts, and trim; base members; and framed openings. All work to be coordinated with all other portions of the work including but not limited to doors, windows, insulation, sealants, finishes, structural and mechanical and electrical systems and elements. The Contractor is responsible for obtaining the City of Craig approval of shop drawings and calculations for the pre-engineered building frame and components.
- B. Metal Building Systems Including:
 - 1. Metal Framing Components
 - 2. Metal Wall SIP Panels and Trim
 - 3. Metal Roof SIP Panels and trim

1.2 RELATED SECTIONS

- 1. 076200 Sheet Metal Flashing & Trim
- 2. 079200 Joint Sealants
- 3. 081113 Hollow Metal Doors and Frames
- 4. 087100 Door Hardware

1.3 DESIGN REQUIREMENTS

- A. The building shall be designed by the Manufacturer as a complete system. Members and connections not indicated on the drawings shall be the responsibility of the Manufacturer and/or Contractor. All components of the system shall be supplied or specified by the same manufacturer.
- B. The Building Manufacturer shall be certified for AISC's QUALITY CERTIFICATION, CATEGORY MB program. This project shall be engineered and fabricated to meet the requirements of this certification.
- C. All structural mill sections and welded plate sections shall be designed in accordance with the AISC's "Manual of Steel Construction".
- D. All cold-formed steel structural members shall be designed in accordance with the latest edition of AISI's "Cold-formed Steel Design Manual".
- E. All roof and wall panels shall be designed in accordance with the AISI's "Cold-formed Steel Design Manual".

- F. Welded connections shall comply with the American Welding Society's (AWS) "Standard Code for Arc and Gas Welding in Building Construction" for welding procedures.
- G. All materials shall be new and unused prior to fabrication. The Building Manufacturer shall warrant the materials manufactured by it, if properly erected in accordance with the plans, specifications and erection manual furnished by it, against defects in materials and workmanship for a period of one (1) year after delivery
- H. The Building Manufacturer shall be MBMA certified.
- I. Governing Design Code: Structural design for the metal building system shall be performed by the manufacturer of the metal building system in accordance with the building loads provided in the contract documents and IBC 2012.
- J. Design Basis
 - 1. Use standards, specifications, recommendations, findings, and interpretations of professionally recognized groups as basis for establishing design, drafting, fabrication, and quality criteria, practices, and tolerances, including the AISC Code of Standard Practice for Steel Buildings and Bridges.
 - 2. Design structures in accordance with MBMA Metal Building Systems Manual including fabrication and erection tolerances.
 - 3. Design structural mill sections and welded plate sections in accordance with AISC 360, ASD Method.
 - 4. Design the lateral force resisting systems and related components for seismic loads in accordance with AISC 341.
 - 5. Design cold-formed steel structural members and panels in accordance with AISI S-100.
 - 6. Design all bolted joints in accordance with RCSC Specification.
 - 7. Design roof assembly tested in accordance with UL 580 Class 90.
- K. Design Loads:
 - 1. In accordance with Contract Documents and manufacturer's standard design practices.
 - 2. Design loads include dead loads, roof live loads, wind loads, seismic loads, collateral loads, auxiliary loads, floor live loads and applied or specified loads.

1.4 SUBMITTALS

A. Submittals for Review:

- 1. Shop Drawings:
 - a. Complete erection drawings with identification and assembly of building components.
 - b. Show anchor bolt settings, transverse cross-sections, sidewall, endwall, and roof framing, flashing and sheeting, and accessory installation details.
 - c. Bear seal and signature of Registered Professional Engineer in the State of Alaska responsible for metal building system design.
- 2. Manufacturer installation manual showing:
 - a. Preparation instructions and recommendations.

- b. Storage and handling requirements and recommendations.
 - c. Installation methods.
 - 3. Structural Design Calculations: 1 set sealed and signed by a professional engineer licensed in the State of Alaska.
 - 4. Documentation including test reports supporting Thermal Transmission Coefficients (U-factors) and Solar Heat Gain Coefficients (SHGC; for non-opaque components only) of building envelope components specified in this section.
- B. Samples:
- 1. Submit color chips showing manufacturer's full range of available colors and patterns for each finish product.
 - 2. After color selection submit samples representing actual product, color, and patterns.
- C. Quality Control Submittals:
- 1. IAS AC472 Certificate for each facility involved in the design and fabrication of the Metal Building System.
 - 2. Certified Erector Certificate issued to the erector by the manufacturer.

1.5 QUALITY ASSURANCE

- A. Manufacturer and Fabricator Qualifications: Primary products furnished by single IAS AC472 accredited manufacturer/fabricator with minimum 5 years of experience.
- B. Erector Qualifications:
 - 1. Single installer with minimum 5 years of experience in installing products of same or similar type and scope.
- C. Welder Qualifications: AWS D1.1/D1.1M and/or AWS D1.3/D1.3M

1.6 RECEIVING, STORAGE AND HANDLING OF MATERIALS ON JOB SITE

- A. General: all materials shall be unloaded, handled, hauled and delivered to storage by competent workmen in a manner which will prevent bends, dents, scratches or other damage. Damaged materials shall be rejected and promptly replaced at no additional cost to the owner. All materials shall be properly stored and protected from weather damage. All shipments must be thoroughly checked by the consignee. If shortage or damage is found, a notation must be placed on the bill of lading and must be confirmed by the carrier.
- B. Primed materials: upon receipt, all bundles of primed material shall be stored on blocking at an angle sufficient to allow any trapped water to drain and should be protected from weather by covers allowing air circulation. Water, ice and snow should not be allowed to collect and remain thereon.
- C. Roof and wall panels: bundles of panels shall be inspected for moisture upon receipt. If moisture is present, dry the panels and, if possible, store them in a warm, dry place. The panel bundles shall be elevated and sloped in a manner to allow moisture to drain. Cover all bundles with a tarp or plastic, leaving air spaces for adequate air circulation.

1.7 WARRANTY

- A. Special Manufacturer's Warranty: On manufacturer's standard form, in which manufacturer agrees to repair or replace metal building system components that fail in materials and workmanship within one year from date of Substantial Completion.
- B. Special Weathertightness Warranty: On manufacturer's standard form, in which manufacturer agrees to repair or replace metal building system components that fail to remain weathertight, including leaks, without monetary limitation within 5 years from date of Substantial Completion.
- C. Special Warranty on Roof and Wall Panel Finishes: On manufacturer's standard form, agreeing to repair or replace metal panels that show evidence of deterioration of factory applied finishes within specified warranty period. Include acknowledgment that the project location is approximately 2,000 feet from salt water.
 - 1. Color fading more than 5 Hunter units when tested according to ASTM D2244.
 - 2. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
 - 3. Cracking, checking, peeling, or failure of paint to adhere to bare metal.Finish warranty period to be 20 years from date of substantial completion.

1.8 ADMINISTRATION

- A. All nomenclature shall conform to the MBMA Metal Building Systems Manual.
- B. Coordination and administration of the work shall be in accordance with the MBMA Metal Building Systems Manual - Common Industry Practices.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Unless otherwise noted or specified, all products shall be new, free from oxidation or corrosion and the "best" quality for the intended use.

2.2 MANUFACTURERS

- A. Basis of Design Manufacturer: Star Building Systems, a subsidiary of NCI Building Systems, Inc. (www.starbuildings.com). Other acceptable manufacturers include:
 - 1. Metallic Building Co., subsidiary of NCI Building Systems, Inc. (www.metallic.com)
 - 2. Ceco Building Systems, subsidiary of NCI Building Systems, Inc. (www.cecobuildings.com)
 - 3. Varco Pruden, (www.vp.com)

2.3 MATERIALS

- A. Primary Framing Steel:

1. Hot-rolled shapes: ASTM A 36 or ASTM A 992 or ASTM A572, minimum yield of 36 ksi (248 MPa) or 50 ksi (345 MPa).
2. Built-up sections:
 - a. Webs:
 - 1) ASTM A 1011 or ASTM A1018, SS or HSLAS Class 1, Grade 55 (380) for webs 3/16 inch (4.76 mm) thick and thinner.
 - 2) ASTM A 572 Grade 50 (340) or 55 (380) for webs thicker than 3/16 inch (4.76 mm).
 - b. Flanges: ASTM A 529 Grade 55 (380) or ASTM A 572 Grade 50 (340) or 55 (380).
3. Round tube: ASTM A 500, Grade B or C with minimum yield strength of 42 ksi (290 MPa).
4. Square and rectangular tube: ASTM A 500, Grade B or C, minimum yield strength of 42 ksi (290 MPa).
5. Cold-formed C sections: ASTM A 1011, Grade 55 (380), or ASTM A 653, Grade 55 (380).
6. X-bracing: ASTM A 529 or A 572 for rod bracing 36 ksi (248 MPa) or 50 ksi (345 MPa), ASTM A 36 for angle bracing or ASTM A 475 for cable bracing.

B. Secondary Framing Steel:

1. Purlins, girts, and eave struts: ASTM A 1011 Grade 55 (380), or ASTM A 653, Grade 55 (380).
2. Finish: G-90 Pre-galvanized shop coat. Shop coat only intended to provide temporary protection during transportation and erection.

C. Rigid Frame Connections: Provide High Strength Bolts, Nuts and Washers:

- a. Bolts: ASTM A 325 or ASTM A 490 Heavy Hex Structural Type I as required by manufacturer's design.
- b. Washers: ASTM F 436 Type 1 Hardened Steel.
- c. Nuts: ASTM A 563 Grade C Heavy Hex.
- d. Coating: [ASTM F 1941 Electrodeposited Yellow Zinc] [Hot-Dipped Galvanized].
- e. Other Connections: Provide High Strength or Machine Bolts as required by manufacturer design.

2.4 ROOF PANELS AND FINISHES

- A. Roof Panel Description:** Roof panels shall have major ribs 12" on center and 1-3/16" high. In the flat area between the major ribs shall be two smaller ribs. Each panel shall provide 36" net coverage in width, side laps of at least one major rib and a purlin-bearing leg.

B. Panel Finish

1. The panels shall have an exterior finish meeting or exceeding for the following criteria:

a. Exterior Surface:

- (1) Prime Coat: The base metal shall be pretreated and primed with Galvalume AZ50 for superior adhesion and superior resistance to corrosion. The dry film thickness shall be 0.2 mils.
 - (2) Exterior coat: After priming, the exterior side shall be given a 20 year long life coating baked in excess of 500 degrees F. to a controlled dry film thickness of 0.7 to 0.8 mils.
 - (3) Excellent weatherability and resistance to coating deterioration shall be evident when subjected to the following tests:
 - (a) Humidity Resistance: Immediately after removal from cabinet, the exposed area shall contain less than 5% No. 8 blisters, after 1000 hours when tested according to ASTM D-2247.
 - (b) Salt Spray Resistance: Immediately after removal from cabinet, the exposed area shall contain less than 5% No. 8 blisters, after 750 hours when tested according to ASTM B-117.
 - (c) Specular Gloss: The gloss rating shall be 25-35 degrees on a Gardner 60 degree gloss meter when tested in accordance with ASTM 523.
 - (d) Hardness: The coating shall have a minimum paint hardness of F-2H using Eagle Turquoise drawing pencils.
 - (e) Q.U.V. Weatherometer: There shall be no objectionable color change, chalking or blistering after 300 hours when tested in accordance with ASTM G 53.
- b. Interior Finish: The interior finish shall have a parchment polyester top coat over an epoxy or urethane primer. The dry film thickness shall be 0.3 mils.

2. Color Selection: By Owner

- C. Panel Length and Endlaps: All roof panels shall be continuous from eave to ridge except where lengths become prohibitive for handling purposes. All end laps shall be at least 6".
- D. Closure Strips: The corrugations of the roof panels shall be filled with a preformed closed cell, laminated polyethylene foam closure along the eaves and ridge for weather tightness.
- D. Sealants: The roof side-laps and end-laps shall be sealed with a mastic sealer 3/16" diameter for roof slopes of 1:12 or greater, and 1/2" x 1/8" tape for roof slopes less than 1:12. The material shall be a butyl base elastic compound with a minimum

solid content of 99%, Chemseco Sealum TC95 or equal. The sealer shall have good adhesion to metal and be non-staining, non-corrosive, non-shrinking, non-oxidizing, non-toxic, and non-volatile. The service temperature shall be from -60 degrees F to +212 degrees F. The material shall meet or surpass the requirements of Federal Specification TT-C-1196A Type II, Class B and NAAMM SS-1C-68.

E. Roof Panel Fasteners

1. Roof panels shall be attached to the secondary framing members by self-drilling stainless steel screws and clips, assembled with a 0.040" minimum thickness nylon isolation washer.
2. Roof panels to be stitched by self-taping stainless steel screws, Type "A" or "AB", assembled with a 0.040" minimum thickness nylon isolation washer.
3. The fasteners shall be color coordinated with a premium coating system which assures a 20 year performance against corrosion and weathering. The fasteners shall be suitable for use with fiberglass blanket insulation from 0" to 4" thick. Plastic color caps are not allowed.

F. Non-Penetrating Snow Guards

1. System Description
 - a. Attachment system to provide attachment to standing seam metal roofs:
 1. With only minor dimpling of panel seams.
 2. Without penetrations through roof seams or panels.
 3. Without use of sealers or adhesives.
 4. Without voiding roof warranty.
 - b. Materials: Clamps, brackets and clips shall be fabricated from 6061-T6 aluminum extrusions conforming to ASTM B221 or aluminum castings conforming to ASTM B85.
 - c. Clamp Model: As recommended by clamp manufacturer and as approved by metal roof panel manufacturer.
 - d. Fasteners: Stainless steel.
 - e. Color Strips: Same material and finish as metal roof panels.
 - f. Snow and Ice Clips: Aluminum, with rubber foot, minimum 3 inches wide.
 - g. Performance Requirements: Provide snow guards to withstand exposure to the weather and environmental elements, and resist design forces without failure due to defective manufacture.
 1. Source Limitation: Provide snow guard system as designed and tested by the manufacturer as a complete system. Install components by the same manufacturer.

2.5 WALL PANELS AND FINISHES

- A. Wall Panel Description: Wall panels shall have major ribs 12" on center and 1-3/16" high. In the flat area between the major ribs shall be two smaller ribs. Each panel shall provide 36" net coverage in width and side laps of at least one major rib.
- B. Wall Panel Material: Panel material shall be 26 gauge and have a minimum yield stress of 80,000 psi (Grade E).
- C. Panel Finish
 - 1. The panels shall have an exterior finish meeting or exceeding for the following criteria:
 - a. Exterior Surface:
 - 1) Prime Coat: The base metal shall be pretreated and primed with Galvalume AZ50 for superior adhesion and superior resistance to corrosion. The dry film thickness shall be 0.2 mils.
 - 2) Exterior Coat: After priming, the exterior side shall be given a 20 year long life coating baked in excess of 500 degrees F. to a controlled dry film thickness of 0.7 to 0.8 mils.
 - 3) Excellent weatherability and resistance to coating deterioration shall be evident when subjected to the following tests:
 - a) Humidity Resistance: Immediately after removal from cabinet, the exposed area shall contain less than 5% No. 8 blisters, after 1000 hours when tested according to ASTM D-2247.
 - b) Salt Spray Resistance: Immediately after removal from cabinet, the exposed area shall contain less than 5% No. 8 blisters, after 750 hours when tested according to ASTM B-117.
 - c) Specular Gloss: The gloss rating shall be 25-35 degrees on a Gardner 60 degree gloss meter when tested in accordance with ASTM 523.
 - d) Hardness: The coating shall have a minimum paint hardness of F-2H using Eagle Turquoise drawing pencils.

- e) Q.U.V. Weatherometer: There shall be no objectionable color change, chalking or blistering after 300 hours when tested in accordance with ASTM G 53.
 - 4. Interior Finish: The interior finish shall have a parchment polyester top coat over an epoxy or urethane primer. The dry film thickness shall be 0.3 mils.
 - 2. Color Selection Exterior panel and trim colors will be selected by the OWNER from the Building Manufacturer's standard colors with minimum 12 colors to choose from. Submit two (2) color charts with the proposal.
- D. Wall Panel Fasteners
- 1. Wall panels shall be attached to the secondary framing members by self-drilling stainless steel screws, No. 12 x 1 1/4" hex washer head, assembled with a 0.040" minimum thickness nylon isolation washer.
 - 2. Wall panel sidelaps shall be stitched by self-taping stainless steel screws, No. 14 x 3/4" Type "A" or "AB", assembled with a 0.040" minimum thickness nylon isolation washer.
 - 3. The fasteners shall be color coordinated with a premium coating system which assures a 20 year performance against corrosion and weathering. The fasteners shall be suitable for use with fiberglass blanket insulation from 0" to 4" thick. Plastic color caps are not allowed.
- E. Panel Length: All wall panels shall be continuous from sill to roof line except where lengths become prohibitive for handling purposes. Any end laps shall be at least 4".
- F. Closure Strips: At the eaves and rake and where panels end over or under a door, window, louver or other such wall openings, the wall panel corrugations shall be filled with a pre-formed closed cell, laminated polyethylene foam closure when required for weather tightness.

2.6 INSULATED METAL WALL & ROOF PANELS

- 1. Labeling: Labeled through a nationally recognized program, identifying the manufacturer, product name and model and product listings required in this section.
- 2. Panel Core: Foamed in-place, Zero Ozone Depletion Potential polyurethane or polyisocyanurate.
- 3. Fire Resistance:
 - a. FM 4880 Class 1 Approval with no height restrictions.

- b. Flame Spread and Smoke Developed Index: The Flame Spread Index shall not exceed 25 and the Smoke Developed Index shall not exceed 450 when tested to ASTM E 84.
- 4. Panel Strength: Determine and certify panel allowable strengths as follows:
 - a. Positive Loading (Toward Panel Supports): Determine in accordance with ASTM E 72.
 - b. Negative Loading (Away from Panel Supports): Determine in accordance with ASTM E 1592.
- 5. U-Factor Determination: ASTM C 1363 conducted in accordance with ASHRAE 90.1 Section A9.3.2 or by Finite Element Modeling per ASHRAE 90.1 Section A9.4 and using core insulation thermal conductivity (k-factor) determined using ASTM C 518 conducted at 75-degree F mean temperature in the calculation
- 6. Maximum U-factor: .05 (Walls) .03 (Roof) BTU/hour-square foot-degree F.
- 7. Air Infiltration: Maximum air infiltration of 0.04 cubic feet per minute per square foot of specimen area when tested to ASTM E 1680 at a pressure differential of +/- 1.57 psf (75 Pa).
- 8. Water Infiltration: No uncontrollable water leakage when tested to ASTM E 1646 at a 20 psf (955 Pa) pressure differential when sprayed with 5 gallons of water per hour per square foot (203 liters per square meter) of specimen area.

2.5 GUTTER, RAKE AND WALL TRIM

- A. Exterior gutters shall be 24 gauge, G90 galvanized or aluminum-zinc alloy coated steel with the same finish as the wall panels. Color to be selected by Owner from manufacturers standard colors.
- B. Downspouts shall be 28 gauge galvanized or aluminum-zinc alloy coated steel with a color coordinated, pre-painted finish. Their color shall be the same as the wall panels.
- C. Standard rake trim shall be 26 gauge, G90 galvanized or aluminum-zinc alloy coated steel with the same finish as the wall panels. Color shall be White or Burnished Slate. If the roof is a Standing Seam or Loc-Seam system, the rake shall be attached to the endwall material with a slip joint, allowing the rake to expand and contract with the roof system.
- D. Wall trim shall be 26 gauge, G90 galvanized or aluminum-zinc alloy coated steel with the same finish as the wall panels. Color shall be the same as the wall panels.
- E. All gutter and downspout joints, rake flashing laps, ridge flashing laps, doors, windows and louvers shall be sealed with Sika Sikaflex 201 caulk or equal. It shall meet or exceed the requirements of Federal Specification TT-S-00230C, Type II, Class A.

2.6 BASE MEMBER

- A. Standard Base Angle: The base of the wall panels is to be attached to a pre-finished 18 gauge minimum thickness structural trim configured to create a sheeting ledge and water stop. This component is to be provided by the Building Manufacturer.
- B. At sills where the wall panels do not extend to the slab, a pre-painted base member 0.043" thick or a girt plus flashing detail shall be used. Unless clearly stated otherwise, the base member and girt are not to be designed as a horizontal spandrel bracing the top of the hardwall wainscot.

2.7 FRAMED OPENINGS

- A. Framed Openings shall be designed to structurally replace displaced framing and to resist applicable wind loads. Framing shall consist of jambs, a header and, if required, a seal. Color coordinated flashings of 26 gauge (minimum) steel shall be provided to conceal panel edges at the opening. Furnish openings as shown on the drawing. Provide flashing and waterproof assemblies as detailed and required for complete watertight installation.

2.8 INSULATION

Provide insulation as noted on the drawings. Insulation shall be installed, as a minimum, to industry standards and applicable Sections of the Contract Documents.

2.9 DOORS

- A. Contractor shall furnish all parts, frames, housings, and incidentals as necessary for a complete and operable facility.
- B. Man-doors per schedule and Section 08250.
- C. Door hardware per Section 08700 and schedule.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean surfaces prior to installation.
- B. Prepare surfaces using methods recommended by manufacturer for best result for substrate.

C. INSPECTION

- 1. Prior to all work of this section, carefully inspect the installed work of all other trades affecting this work and verify that all such work is complete to the point where this installation may properly commence.

2. Verify that all items to be embedded in concrete are in place, properly oriented, located and secured.

D. DISCREPANCIES: In the event of a discrepancy, do not proceed with installation until all such discrepancies have been resolved by the Architect.

3.2 INSTALLATION

A. The erection of the metal building and the installation of accessories shall be performed in accordance with the Building Manufacturer's erection drawings and erection manuals by a qualified erector using proper tools, equipment and safety practices.

B. The erection company must have a minimum of 5 years of erection experience with pre-engineered metal buildings under one company name, must comply with all OSHA regulations, and provide to Owner agenda of weekly safety meetings. A list of all equipment to be used for erection must be provided to Architect for approval before starting erection of building.

C. Erection practices shall conform to Section 6, Common Industry Practices found in the "Low Rise Building Systems Manual", MBMA 1986.

D. There shall be no field modifications to primary structural members except as authorized and specified by the Building Manufacturer. Install system in accordance with manufacturer's instructions and approved Shop Drawings.

E. Fit members square against abutting components.

F. Position members plumb, square, and level.

G. Temporarily brace members until permanently fastened.

H. Do not splice load bearing members.

I. Align and adjust various members forming parts of a complete frame or structure after assembly but before fastening.

J. Welding to conform to AWS D1.1.

K. Fasten panels to supports.

L. Install trim to maintain visual continuity of system.

M. Install joint sealant and gaskets to prevent water penetration.

N. Flash penetrations through roofing with metal trim to match panels

3.3 PROTECTION

A. Protect installed products until completion of project.

3.4 ADJUSTMENT

A. Touch up, repair, or replace damaged products before Substantial Completion.

END OF SECTION 133419

SECTION 221116 - DOMESTIC WATER 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. This Section includes domestic water piping inside the building.

1.3 DEFINITIONS

- A. PEX: Crosslinked polyethylene plastic.

1.4 SUBMITTALS

- A. Product Data: For pipe, tube, fittings, and couplings.
- B. Water Samples: Specified in Part 3 "Cleaning" Article.
- C. Field quality-control test reports.

1.5 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9," for potable domestic water piping and components.
- C. PEX pipe and associated fittings are to be warranted for a complete distribution system by PEX pipe manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PIPING MATERIALS

- A. Refer to Part 3 "Pipe and Fitting Applications" Article for applications of pipe, tube, fitting, and joining materials.
- B. Transition Couplings for Aboveground Pressure Piping: Coupling or other manufactured fitting the same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

2.3 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Types L and M, water tube, drawn temper.
 - 1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
 - 2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends. Furnish Class 300 flanges if required to match piping
 - 3. Copper Unions. MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
 - 4. Copper Press-Seal Fittings: Shall conform to the material requirements of ASME B16.18 bronze and ASME B16.22 copper, and the performance requirements of IAPMO PS117.
 - 5. Copper Press Seal Fittings:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Elkhart Products Corporation.
 - 2) NIBCO, Inc.
 - 3) Tyco GRINNELL.
 - 4) Viega.
 - b. Fittings for NPS 2 and Smaller: Wrought-copper or lead-free bronze fitting with EPDM sealing element in each end.
 - c. Fittings for NPS 2-1/2 to NPS 4: Lead-free bronze or wrought-copper fitting with EPDM sealing element in each end, 420 stainless grip ring, PBT separator ring and un-pressed fitting, leak identification feature.

2.4 PEX PIPE AND FITTINGS

- A. PEX Distribution System: 3/8-inch thru 2-inch shall conform to, ASTM F876, F877, CSA B 137.5, NSF 61 (NSF@us-pw), and ASTM E84. PEX tubing shall have a Standard Dimensional Ratio designation (SDR 9), with a 100 psi at 180 deg F / 160 psi at 73 deg F pressure, temperature rating, and "PEX5006" chlorine resistance rating. PEX tubing shall have a 60 day minimum UV rating.
 - 1. Fittings for PEX Tube: ASTM F 1807, or ASTM F 2159 and ASTM F877 lead-free metal-insert type with copper crimp rings or metal-insert type with attached 304 stainless steel press sleeve, or plastic-insert type with attached 304 stainless steel press sleeve for use with SDR 9 PEX tube.

2. Manifold: Multiple-outlet, or "Homerun" system shall conform to ASTM 877, CSA 137.5 shall be a copper assembly with brass valves for each outlet or polysulfone with preformed valves attached.
3. All manifolds, PEX tube, fittings and accessories for PEX distribution systems are to be by same manufacturer.
4. All manifolds, PEX tube, fittings and accessories for PEX distribution system are to comply with the manufacturer's warranty and installation requirements.
5. Manufacturers:
 - a. IPEX.
 - b. Uponor WIRSBO.
 - c. Watts Radiant Inc.
 - d. Zurn Plumbing Products Group.

B. PEX Pre-insulated Piping System:

1. Service Tubing: 3/8-inch thru 2-inch shall conform to, ASTM F876, F877, CSA B 137.5, NSF 61 (NSF@us-pw), and ASTM E84. PEX tubing shall have a Standard Dimensional Ratio designation (SDR 9), with a 100 psi at 180 deg F / 160 psi at 73 deg F pressure, temperature rating, and "PEX5006" chlorine resistance rating. PEX tubing shall have a 60 day minimum UV rating.
2. Outer Jacket: Corrugated seamless high density polyethylene (HDPE). The jacket completely encompasses and protects the insulation from moisture and damage. The outer jacket shall be extruded directly over the insulation and is flexible.
3. Insulation: Layered expanded cross-linked water resistant polyethylene closed cell foam.
4. Fittings for PEX Tube: ASTM F 1807, or ASTM F 2159 and ASTM F877 lead-free metal-insert type with copper crimp rings or metal-insert type with attached 304 stainless steel press sleeve, or plastic-insert type with attached 304 stainless steel press sleeve for use with SDR 9 PEX tube.
5. Manufacturers:
 - a. Uponor Ecoflex for Potable Water.

PART 3 - EXECUTION

3.1 PIPE AND FITTING APPLICATIONS

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.
- B. Aboveground Domestic Water Piping: Use the following piping materials:
 1. NPS 6 and Smaller: Hard copper tube, Type L; copper pressure fittings; and soldered joints.
 2. NPS 2 and Smaller: PEX distribution system, insert fittings, and crimped joints or press joints.

3. NPS 1/2 to NPS 4: Hard copper tube, Type L; copper or lead-free bronze press-seal-fittings.
- C. Belowground and Exterior Domestic Water Piping: Use the following piping materials:
1. NPS 2 and Smaller: PEX pre-insulated piping system.

3.2 VALVE APPLICATIONS

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
1. Shutoff Duty: Use bronze ball valves for piping NPS 2 and smaller.
 2. Throttling Duty: Use bronze ball or globe valves for piping NPS 2 and smaller. Use cast-iron butterfly valves with flanged ends for piping NPS 2-1/2 and larger.
 3. Hot-Water-Piping, Balancing Duty: Calibrated balancing valves.
 4. Drain Duty: Hose-end drain valves.
- B. Install calibrated balancing valves in each hot-water circulation return branch and discharge side of each pump and circulator. Set calibrated balancing valves partly open to restrict but not stop flow.
- C. Shutoff Duty: Use bronze press-seal ball valves for NPS 2 and smaller type L copper tube.

3.3 PIPING INSTALLATION

- A. Install domestic water piping level and plumb.

3.4 JOINT CONSTRUCTION

- A. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.
- B. Press Seal Joints: Shall be installed using the most current edition of the manufactures installation guidelines. A factory trained field representative shall provide on-site training for the Contractor's field personnel engaged in the operation and installation of pressure-sealed-joints. Upon completion of this training the installing Contractor must submit documentation, which includes those in attendance, from the grooved products manufacturer to CTA. The factory trained representative shall periodically visit the jobsite, review the product installation and provide additional training if new manpower has been assigned to pressure-sealed-joint piping installation. Contractor shall remove and replace any improperly installed products.

3.5 Below-Grade Installation

- A. Potable pre-insulated piping will be installed in accordance with manufacturer's recommendations.
- B. The system will be installed with the fewest number of underground joints as possible.

- C. The system does not require expansion loops, expansion joints or compensators of any type.
- D. An EPDM rubber end cap will be applied at all terminations of the pre-insulated potable piping system, including all fitting locations, to form a watertight seal.
- E. All buried fittings will be installed, insulated and sealed in accordance with the instructions of the piping manufacturer.
- F. Connection Vaults or Insulation Kits are required for all below-grade installations.
- G. Backfill
 - 1. The pre-insulated potable piping system will be backfilled with clean sand material.
 - 2. Minimum vertical distance from the bottom of the tubing to the trench floor is 4 inches.
 - 3. Minimum lateral distance from the side of the tubing to the trench wall is 6 inches.
 - 4. Install a minimum of 12 inches of clean fill over the top of the pre-insulated potable piping.
- H. The balance of the trench can be backfilled with native soil void of stone greater than 2 inches in diameter.
- I. Pressure testing: Pressure test tubing before and during backfill. Test to 1.5 times operating pressure for a minimum of 1 hour prior to system burial.

3.6 HANGER AND SUPPORT INSTALLATION

- A. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
 - 2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
 - 3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
- B. Install supports for vertical copper tubing every 10 feet.

3.7 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment and machines to allow service and maintenance.

3.8 FIELD QUALITY CONTROL

- A. Inspect domestic water piping as follows:
 - 1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
 - 2. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

- a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
3. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
 4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

B. Test domestic water piping as follows:

1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
4. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.
7. After press-seal fittings have been installed a "step test" shall be followed. Utilizing air, water, or dry nitrogen, pressurize the system not to exceed 85 psi. Walk the system and check for leaks. If you do not locate any leaks proceed to pressurize the system to the recommended pressures, not to exceed 600 psi. Should you locate a leaking joint that has not been pressed, relieve the pressure from the system, insure the tube is fully inserted into the fitting and proceed to press the fitting. Should you locate a fitting that is leaking that has been previously pressed, you can press the fitting a second time. Resume test procedure, after the necessary repairs have been made.

3.9 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Remove plugs used during testing of piping and plugs used for temporary sealing of piping during installation.
4. Check plumbing specialties and verify proper settings, adjustments, and operation.

END OF SECTION 221116

SECTION 230500 - COMMON WORK RESULTS FOR PLUMBING AND HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Record Documents, Maintenance Manuals, and General Provisions for mechanical work.
 - 2. Piping materials and installation instructions common to most piping systems.
 - 3. Dielectric fittings.
 - 4. Mechanical demolition.
 - 5. Equipment installation requirements common to equipment sections.
 - 6. Painting.
 - 7. Concrete bases.
 - 8. Supports and anchorages.

1.3 SUBMITTALS

- A. Product Data: For the following:
 - 1. Dielectric fittings.
- B. Welding certificates.

1.4 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."
- B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
 - 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
 - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- C. Electrical Characteristics for Mechanical Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing by the engineer and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified without added cost to Project. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.5 COORDINATION

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.
- B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- C. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

1.6 FEES AND PERMITS

- A. Contractor shall apply and pay for all permits, inspections, reviews, etc. required by the authorities having jurisdiction.
 - 1. This shall include the cost of extending the natural gas service from the utility company main line to the building meter, setting the meter and regulator and all related utility company costs.
 - 2. The Contractor shall include in his/her Bid all system development or similarly named fee imposed by the serving utility company or governing entity (City, County, etc.).

1.7 RECORD DOCUMENTS

- A. Prepare Record Documents in accordance with the requirements in Division 01 Section "Closeout Procedures." In addition to the requirements specified in Division 01, indicate the following installed conditions:
 - 1. Ductwork mains and branches, size and location, for both exterior and interior; locations of dampers and other control devices; filters, boxes, and terminal units requiring periodic maintenance or repair.
 - 2. Mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located (ie. traps, strainers, tanks, etc.). Refer to Section 230553 "Identification for HVAC Piping and Equipment". Indicate actual inverts and horizontal locations of underground piping.
 - 3. Equipment locations (exposed and concealed) dimensioned from prominent building lines.
 - 4. Approved substitutions, Contract Modifications, and actual equipment and materials installed. Revise equipment schedules.
 - 5. Contract Modifications, actual equipment and materials installed.

1.8 MAINTENANCE MANUALS

- A. Prepare maintenance manuals in accordance with Division 01 Section "Closeout Procedures." In addition to the requirements specified in Division 01. Assemble O & M Manuals as follows:
 - 1. Compile two copies of Operating and Maintenance Manuals for the mechanical systems and equipment. The manuals shall be provided to the Architect for approval complete

and at one time, prior to requesting final payment. Partial or separate data will be returned for completion.

2. Manuals shall be assembled in three-ring binders. Binders shall be 3 inches thick or less and more than one binder shall be used for each set of data if required to prevent overfilling of one binder. Binders shall have plastic coating with correct name of the Project permanently attached to the spine. Binders shall be Sparco, #68031. All information shall be arranged in sections and each section shall have a blank buff colored, heavy paper divider with a protruding tab clearly labeled. Sections shall be arranged in the same order that the equipment is listed in the Specification and each Specification Section shall have a separate tab. Shop Drawings which are larger than 8-1/2 inches x 11 inches shall be individually folded so they are 8-1/2 inches x 11 inches or less and inserted behind the appropriate tab.
3. Tabs shall be labeled and arranged as follows:
 - a. Index: Furnish under the first tab an index of sections listing name of Section and Specification numbers.
 - b. Equipment Manufacturers: Furnish under the second tab a complete typed list of equipment suppliers and manufacturers representative including type of equipment, name, address and phone number. The company listed here should be the one which could furnish replacement parts and offer technical information about the equipment.
 - c. Valve Directory: Furnish under this tab a typed copy of the valve chart required.
 - d. Product Literature: Each tab, starting with the fourth shall contain the name of a Specification Section. Behind each tab shall be the previously submitted and approved Shop Drawing, factory published operation and maintenance instructions and parts lists.
4. Upon completion and approval of the booklets, one copy shall be given to the Architect, and two to the Owner.
5. Electronic Format: Provide all O&M information in a searchable electronic PDF format on CD for submission to the Owner with the hard copies.

1.9 MECHANICAL EQUIPMENT TRAINING

- A. The mechanical contractor shall schedule training with the Owner. Using the O & M Manuals, the mechanical contractor shall explain in detail and instruct the Owner's maintenance personnel in the correct operation and maintenance of the equipment.
 1. The mechanical contractor shall develop and create an agenda to be used during Training.
 2. The mechanical contractor shall provide a sign in sheet to verify dates and types of training and who attended.
- B. Refer to Division 01, section "Demonstration and Training."
- C. Refer to specific training and demonstration requirements in the individual specifications.

1.10 GENERAL PROVISIONS FOR MECHANICAL WORK

- A. Interferences: Project design took into account potential interferences between trades (e.g. mechanical ductwork with piping or with electrical light fixtures), however, not every interference has been eliminated. It shall be the responsibility of the Bidder and potential

Contractor to field verify all mechanical piping and duct routing, making allowances for existing beams, pipes, ducts, hangers, and other obstructions. Provide HVAC duct offsets and transitions as required maintaining duct aspect ratios within 10 percent of design. The cost associated with interferences shall be included in the Base Bid.

B. Examination of Project Drawings:

1. The Drawings (Plans, elevations, flow schematics, etc.) for the mechanical work are intended to convey Scope of Work and to indicate the general arrangements and locations of end-use equipment, systems, etc., and the approximate sizes thereof.
2. The Contractor shall determine the exact location and mounting heights of equipment, rough-ins, and the exact routing and positioning of piping/ductwork equipment so as to best fit the layout of the job. Scaling of the Drawings will not be sufficient for determining these locations. Where job conditions require reasonable changes in indicated arrangements and locations, such changes shall be made, by the Contractor, at no additional cost to the Client.
3. Because of the scale of the Drawings, certain basic items/materials and quantities thereof, (e.g. fittings, connectors, flanges, unions, pipe wells, couplings, hangers, sleeves, clamps, screws, hooks, inserts, pipe/duct mounted - meters, gauges, sensors, etc.) may not be shown, but where such items are required by other sections of the Specifications or where they are required for proper installation of the Work, such items shall be furnished and installed and the cost thereof, reflected in the Base Bid.
4. The determination of quantities of HVAC and plumbing end-use systems and equipment required shall be made by the Contractor from the Drawings. Interferences and quantities and locations of basic items/materials may not be indicated on the Drawings and will require field verification and determination by the Contractor.
5. The Contractor shall coordinate the location and method of support of the piping/duct systems with that of all installations under other Divisions and Sections of the Specifications.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 23 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

- A. Refer to individual Division 23 piping Sections for special joining materials not listed below.

- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
 - 2. AWWA C110, rubber, flat face, 1/8-inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- E. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150 or 300 psig minimum working pressure as required to suit system pressures.
 - 1. Manufacturers:
 - a. Central Plastics Company.
 - b. Epco Sales, Inc.
 - c. Watts Industries, Inc.; Water Products Div.
- D. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
 - 1. Manufacturers:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Central Plastics Company.
 - d. Pipeline Seal and Insulator, Inc.
 - 2. Separate companion flanges and steel bolts and nuts shall have 150 or 300 psig minimum working pressure where required to suit system pressures.
- E. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300 psig minimum working pressure at 225 deg F.

1. Manufacturers:
 - a. Calpico, Inc.
 - b. Lochinvar Corp.

- F. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300 psig minimum working pressure at 225 deg F.
 1. Manufacturers:
 - a. Perfection Corp.
 - b. Precision Plumbing Products, Inc.
 - c. Sioux Chief Manufacturing Co., Inc.
 - d. Victaulic Co. of America.

PART 3 - EXECUTION

3.1 MECHANICAL DEMOLITION

- A. Refer to Division 01 Sections for general demolition requirements and procedures.

- B. Disconnect, demolish, and remove mechanical systems, equipment, and components indicated to be removed.
 1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
 3. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
 4. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
 5. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 6. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 7. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

- C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Drawing Plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

- B. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Select system components with pressure rating equal to or greater than system operating pressure.
- K. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
 - 1. New Piping:
 - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
 - b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
 - c. Insulated Piping: One-piece, stamped-steel type with spring clips.
 - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
 - e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece cast-brass type with polished chrome-plated finish.
 - f. Bare Piping in Unfinished Service Spaces: Split plate, cast-brass or stamped steel type with polished chrome-plated finish.
- L. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials.

3.3 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

- E. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- F. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- G. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.4 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
 - 1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
 - 3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
 - 4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.5 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

3.6 PAINTING

- A. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.7 CONCRETE BASES

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and 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. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
 - 7. Use 3000 psi, 28 day compressive-strength concrete and reinforcement as specified.

3.8 GROUTING

- A. Mix and install grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

END OF SECTION 230500

SECTION 230519 - METERS AND GAGES FOR HVAC 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. This Section includes the following meters and gages for mechanical systems:
 - 1. Thermometers.
 - 2. Gages.
 - 3. Test plugs.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated; include performance curves, Shop Drawings, product certification, operation and maintenance data.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 SOLAR DIGITAL THERMOMETERS

- A. Manufacturers:
 - 1. Ashcroft.
 - 2. Terice, H. O. Co.
 - 3. MILJOCO Corporation
 - 4. Weiss Instruments, Inc.
 - 5. Weksler Instruments.
- B. Case: High Impact ABS Plastic.

- C. Resolution: 0.10 deg F between -50 deg F to 199.9 deg F.
- D. Recalibration: Internal potentiometer.
- E. Display: LCD, black.
- F. Connector: Adjustable type, 180 degrees in vertical plane, 360 degrees in horizontal plane, with locking device.
- G. Stem: Aluminum.
- H. Sensor: Glass passivated thermistor.
- I. Accuracy: Greater value of 1 deg F, or 1 percent of reading.
- J. Range: -58 deg F to 302 deg F, field switchable to deg C.

2.3 THERMOWELLS

- A. Manufacturers: Same as manufacturer of thermometer being used.
- B. Description: Pressure-tight, socket-type metal fitting made for insertion into piping and of type, diameter, and length required to hold thermometer.

2.4 PRESSURE GAGES

- A. Manufacturers:
 1. Ashcroft Commercial Instrument Operations; Dresser Industries; Instrument Div.
 2. Ernst Gage Co.
 3. Eugene Ernst Products Co.
 4. Marsh Bellofram.
 5. MILJOCO Corporation
 6. Palmer - Wahl Instruments Inc.
 7. Trerice, H. O. Co.
 8. Weiss Instruments, Inc.
 9. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.
- B. Direct-Mounting, Dial-Type Pressure Gages: Indicating-dial type complying with ASME B40.100.
 1. Case: Liquid-filled type, drawn steel or cast aluminum, 4-1/2 inch diameter.
 2. Pressure-Element Assembly: Bourdon tube, unless otherwise indicated.
 3. Pressure Connection: Brass, NPS 1/4, bottom-outlet type unless back-outlet type is indicated.
 4. Movement: Mechanical, with link to pressure element and connection to pointer.
 5. Dial: Satin-faced, nonreflective aluminum with permanently etched scale markings.
 6. Pointer: Red or other dark-color metal.
 7. Window: Glass.
 8. Ring: Metal.

9. Accuracy: Grade A, plus or minus 1 percent of middle half scale.
10. Range for Fluids under Pressure: Two times operating pressure.

C. Pressure-Gage Fittings:

1. Valves: NPS 1/4 brass ball valve with teflon seat equal to Trerice Model #866.
2. Snubbers: ASME B40.5, NPS 1/4 brass bushing with corrosion-resistant, porous-metal disc of material suitable for system fluid and working pressure.

2.5 TEST PLUGS

A. Manufacturers:

1. Flow Design, Inc.
2. Peterson Equipment Co., Inc.
3. Sisco Manufacturing Co.
4. Trerice, H. O. Co.
5. Watts Industries, Inc.; Water Products Div.

B. Description: Corrosion-resistant brass or stainless steel body with core inserts and gasketed and threaded cap, with extended stem for units to be installed in insulated piping.

C. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F.

D. Core Inserts: One or two self-sealing rubber valves.

1. Insert material for air, water, oil, or gas service at 20 to 200 deg F shall be CR.
2. Insert material for air or water service at minus 30 to plus 275 deg F shall be EPDM.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Install meters and gages as indicated.

B. Provide the following temperature ranges for thermometers:

1. Domestic Hot Water: 30 to 180 deg F, with 2-degree scale divisions.
2. Domestic Cold Water: 0 to 100 deg F, with 2-degree scale divisions.
3. Heating Hot Water: 30 to 240 deg F, with 2-degree scale divisions.

3.2 INSTALLATIONS

A. Install direct-mounting thermometers and adjust vertical and tilted positions.

- B. Install thermowells with socket extending one-third of diameter of pipe and in vertical position in piping tees where thermometers are indicated.
- C. Install direct-mounting pressure gages in piping tees with pressure gage located on pipe at most readable position.
- D. Install ball-valve and snubber fitting in piping for each pressure gage for fluids (except steam).
- E. Install test plugs in tees in piping.

3.3 ADJUSTING

- A. Adjust faces of meters and gages to proper angle for best visibility.

END OF SECTION 230519

SECTION 230523 - GENERAL-DUTY VALVES FOR PLUMBING AND HVAC 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. This Section includes general duty valves common to several mechanical piping systems.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 01 Specification Sections.
- B. Product Data for each valve type. Include body material, valve design, pressure and temperature classification, end connection details, seating materials, trim material and arrangement, dimensions and required clearances, and installation instructions. Include list indicating valve and its application.

1.4 QUALITY ASSURANCE

- A. Single-Source Responsibility: Comply with the requirements specified in Division 01 Section "Materials and Equipment," under "Source Limitations" Paragraph.
- B. ASME Compliance: Comply with ASME B31.9 for building services piping and ASME B31.1 for power piping.
- C. MSS Compliance: Comply with the various MSS Standard Practice documents referenced.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ball Valves:
 - a. Conbraco Industries, Inc.; Apollo Division.
 - b. Milwaukee Valve Company, Inc.
 - c. Hammond Valve.

- d. Kitz Corporation of America.
 - e. Victaulic Company of America.
 - f. NIBCO, Inc.
 - g. Watts Industries, Inc.
2. Globe Valves:
- a. Crane Company; Valves and Fitting Division.
 - b. Hammond Valve.
 - c. Kitz Corporation of America.
 - d. Milwaukee Valve Company, Inc.
 - e. NIBCO Inc.
 - f. Powell: Wm. Powell Company (The).
3. Butterfly Valves:
- a. Crane Company; Valves and Fitting Division.
 - b. General Signal; DeZurik Unit.
 - c. Grinnell Corp.
 - d. Hammond Valve.
 - e. Keystone Valve USA, Inc.
 - f. Kitz Corporation of America.
 - g. Line, Mark Controls Corporation.
 - h. Milwaukee Valve Company, Inc.
 - i. NIBCO Inc.
 - j. Victaulic Company of America.
4. Swing Check Valves:
- a. Crane Company; Valves and Fitting Division.
 - b. Hammond Valve.
 - c. Kitz Corporation of America.
 - d. Milwaukee Valve Company, Inc.
 - e. NIBCO, Inc.
 - f. Powell: Wm. Powell Company (The).
 - g. Victaulic Company of America.
 - h. Watts Industries, Inc.
5. Silent Check Valves:
- a. Conbraco Industries, Inc.; Apollo Division.
 - b. Hammond Valve.
 - c. Keystone Valve USA, Inc.
 - d. Metraflex Company.
 - e. Milwaukee Valve Company, Inc.
 - f. NIBCO Inc.
 - g. Victaulic Company of America.

2.2 BASIC, COMMON FEATURES

- A. Design: Rising stem or rising outside screw and yoke stems, except as specified below.

1. Nonrising stem valves may be used only where headroom prevents full extension of rising stems.
- B. Pressure and Temperature Ratings: As indicated in the "Application Schedule" of Part 3 of this Section and as required to suit system pressures and temperatures.
- C. Sizes: Same size as upstream pipe, unless otherwise indicated.
- D. Operators: Use specified operators and handwheels, except provide the following special operator features:
 1. Handwheels: For valves other than quarter turn.
 2. Lever Handles: For quarter-turn valves 6 inches and smaller, except for plug valves, which shall have square heads.
- E. Extended Stems: Where insulation is indicated or specified, provide extended stems arranged to receive insulation.
- F. Bypass and Drain Connections: Comply with MSS SP-45 bypass and drain connections.
- G. Threads: ASME B1.20.1.
- H. Flanges: ASME B16.1 for cast iron, ASME B16.5 for steel, and ASME B16.24 for bronze valves.

2.3 BALL VALVES

- A. Ball Valves, 2 Inches and Smaller: MSS SP-110, Class 150, 600 psi CWP, ASTM B 584 bronze body and bonnet, 2-piece construction; chrome-plated brass ball, standard port for 1/2-inch valves and smaller and conventional port for 3/4-inch valves and larger; blowout proof; bronze or brass stem; Teflon seats and seals. Ball valves shall be full-port type for steam condensate applications as indicated.
 1. Operator: Vinyl-covered steel lever handle.
 2. Stem Extension: For valves installed in insulated piping.
- B. End Connection: Threaded.

2.4 GLOBE VALVES

- A. Globe Valves, 2 Inches and Smaller: MSS SP-80; Class 125, 200 psi CWP, or Class 150, 300 psi CWP; ASTM B 62 cast-bronze body and screwed bonnet, rubber, bronze, or Teflon disc, silicon bronze-alloy stem, Teflon-impregnated packing with bronze nut, and with aluminum or malleable-iron handwheel.
- B. End Connection: Threaded.
- C. Globe Valves, 3 Inches and Larger: MSS SP-85, Class 125, 200 psi CWP, ASTM A 126 cast-iron body and bolted bonnet with bronze fittings, renewable bronze seat and disc, brass-alloy

stem, outside screw and yoke, Teflon-impregnated packing with cast-iron follower, flanged end connections; and with cast-iron handwheel.

2.5 BUTTERFLY VALVES

- A. Butterfly Valves: MSS SP-67, 200 psi CWP, 150 psi maximum pressure differential, ASTM A 126 cast-iron body and bonnet, extended neck, stainless-steel stem, EPDM sleeve and stem seals, wafer, lug, or grooved style:
 - 1. Disc Type: Nickel-plated ductile iron for HVAC and plumbing.
 - 2. Operator for Sizes 2 Inches to 6 Inches: Lever handle with latch lock.
 - 3. Operator for Sizes 8 Inches to 24 Inches: Gear operator with position indicator.
- B. Valves shall be capable of bubble-tight dead-end shut-off at full rated pressure without the need of a downstream blind flange.

2.6 CHECK VALVES

- A. Swing Check Valves, 2 Inches and Smaller: MSS SP-80; Class 125, 200 psi CWP, or Class 150, 300 psi CWP; horizontal swing, Y-pattern, ASTM B 62 cast-bronze body and cap, rotating bronze disc with rubber seat or composition seat.
- B. End Connection: Threaded.
- C. Swing Check Valves, 2-1/2 Inches and Larger: MSS SP-71, Class 125, 200 psi CWP, ASTM A 126 cast-iron body and bolted cap, horizontal-swing bronze disc, flanged or grooved end connections.
- D. Silent Check Valves: Class 125, 200 psi CWP, ASTM A 126 cast-iron body, bronze disc/plates, stainless steel pins and springs, Buna N seals, wafer or flanged style.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine piping system for compliance with requirements for installation tolerances and other conditions affecting performance of valves. Do not proceed with installation until unsatisfactory conditions have been corrected.
- B. 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.
- C. Operate valves from fully open to fully closed positions. Examine guides and seats made accessible by such operation.
- D. Examine threads on valve and mating pipe for form and cleanliness.

- E. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Check gasket material for proper size, material composition suitable for service, and freedom from defects and damage.
- F. Do not attempt to repair defective valves; replace with new valves.

3.2 INSTALLATION

- A. Install valves as indicated, according to manufacturer's written instructions.
- B. Install valves with unions or flanges at each piece of equipment arranged to allow servicing, maintenance, and equipment removal without system shutdown.
- C. Locate valves for easy access and provide separate support where necessary.
- D. Install valves in horizontal piping with stem at or above the center of the pipe.
- E. Install valves in a position to allow full stem movement.
- F. Installation of Check Valves: Install for proper direction of flow as follows:
 - 1. Swing Check Valves: Horizontal position with hinge pin level.
 - 2. Silent Check Valves: Horizontal or vertical position.

3.3 VALVE END SELECTION

- A. Select valves with the following ends or types of pipe/tube connections:
 - 1. Copper Tube Size, 2 Inches and Smaller: Threaded ends.
 - 2. Steel Pipe Sizes, 2 Inches and Smaller: Threaded or grooved end.
 - 3. Steel Pipe Sizes, 2-1/2 Inches and Larger: Grooved end or flanged.

3.4 APPLICATION SCHEDULE

- A. General Application: Use ball, and butterfly valves for shutoff duty; globe, ball, and butterfly for throttling duty. Refer to piping system Specification Sections for specific valve applications and arrangements. Select trim to suit piping systems:
- B. Domestic Water Systems: Use the following valve types.
 - 1. Ball Valves: Class 150, 600 psi CWP, with stem extension.
 - 2. Bronze Swing Check: Class 125, with rubber seat.
- C. Heating Water Systems: Use the following valve types.
 - 1. Ball Valves: Class 150, 600 psi CWP, with stem extension and memory stop.
 - 2. Globe Valves: Class 150, bronze or cast-iron body to suit piping system, and bronze disc.
 - 3. Butterfly Valves: Nickel-plated ductile iron or aluminum bronze EPDM or Buna N sleeve and stem seals.

4. Bronze Swing Check: Class 150, with composition seat.
5. Check Valves: Iron swing, wafer, or lift type, as indicated. Swing check shall be Class 150 with bronze seat ring.

3.5 ADJUSTING

- A. Adjust or replace packing after piping systems have been tested and put into service, but before final adjusting and balancing. Replace valves if leak persists.

END OF SECTION 230523

SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Metal pipe hangers and supports.
 - 2. Trapeze pipe hangers.
 - 3. Metal framing systems.
 - 4. Thermal-hanger shield inserts.
 - 5. Fastener systems.
 - 6. Equipment supports.

1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 SUBMITTALS

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

1.5 QUALITY ASSURANCE

- A. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.
- B. Thermal-Hanger shield inserts shall be installed at the time of hanger installation.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
 - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 - 2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
 - 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.

4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.2 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.

2.3 THERMAL-HANGER SHIELD INSERTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carpenter & Paterson, Inc.
2. ERICO International Corporation.
3. Mechanical Pipe Shields "SNAP-ITZ."
4. National Pipe Hanger Corporation.
5. PHS Industries, Inc.
6. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
7. Piping Technology & Products, Inc.
8. Rilco Manufacturing Co., Inc.
9. TOLCO a brand of Nibco.
10. Value Engineered Products, Inc.

- B. Insulation-Insert Material for Cold Piping: ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig or water-repellent treated, ASTM C 533, Type I calcium silicate, minimum compressive strength and vapor barrier.

- C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

- D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

- E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.4 FASTENER SYSTEMS

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

- B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.5 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.6 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 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. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.
- D. Thermal-Hanger Shield Installation: Installed by Mechanical Contractor at time of hanger installation. Inserts are required on all cold piping 2 inch and larger.
- E. Fastener System Installation:
 - 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators

- that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- H. 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.
- I. Install lateral bracing with pipe hangers and supports to prevent swaying.
- J. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- L. Insulated Piping:
1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert for pipes 2 inches and larger. Run insulation continuously through hanger and install a galvanized Type 40 insulation shield between hanger and insulation for pipes smaller than 2 inches.
 - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
 2. Where indicated, install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier smaller than 2 inches. Shields shall span an arc of 180 degrees.
 4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
 - b. NPS 4: 12 inches long and 0.06 inch thick.
 - c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
 5. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 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.

3.5 PAINTING

- A. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09 painting Sections.
- 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. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports and attachments for general service applications.
- F. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.
- G. Use padded hangers for piping that is subject to scratching.
- H. Use thermal-hanger shield inserts for cold insulated piping and tubing.
- I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

Pipe Size	Pipe Material	MSS Hanger Type	Manufacturer/Model	Notes
1/2" - 4"	Bare Steel	Type 1	ANVIL Fig. 65	
1/2" - 4"	Bare Copper	Type 9	ANVIL Fig. CT-99 or CT-65	
1/2" - 4"	Insulated Copper (Hot)	Type 9	ANVIL Fig. CT-99 or CT-65	
1/2" - 12"	Insulated Steel (Hot)	Type 1	ANVIL Fig. 300	Hanger may contact pipe.
1/2" - 1-1-2"	Insulated Copper and Steel (Cold)	Type 1	ANVIL Fig. 300 with shield	No pipe contact allowed.
2" - 12"	Insulated Copper and Steel (Cold)	Type 1	ANVIL Fig. 300 with shield and insert	No pipe contact allowed.

- J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.
- K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
 3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
 4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.

5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.
- L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 6. C-Clamps (MSS Type 23): For structural shapes.
 7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
 8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
 9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
 10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
 11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
 12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb.
 - b. Medium (MSS Type 32): 1500 lb.
 - c. Heavy (MSS Type 33): 3000 lb.
 13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
 15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.
- M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- N. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- O. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 230529

SECTION 230549 - SEISMIC CONTROLS FOR PLUMBING AND HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Seismic snubbers.
 - 2. Restraining braces and cables.
 - 3. Restrained isolators.
- B. It is the intent of this section to have the seismic bracing requirements designed by the approved seismic equipment manufacturer and installed by the mechanical contractor. The seismic manufacturer shall be responsible for the structural design of attachment hardware as required to attach snubbers to both the equipment and supporting structure. The manufacturer shall submit seismic shop drawings showing type and location of restraint devices as required to meet the code and performance requirements specified herein. The work under this section shall include all materials and labor necessary for complete execution of installation of seismic restraint assemblies as required per IBC code requirements.
- C. The requirements of this seismic restraint section are in addition to other requirements as specified for support and attachment of equipment and mechanical services.

1.3 DEFINITIONS

- A. IBC: International Building Code.

1.4 PERFORMANCE REQUIREMENT

- A. Seismic-Restraint Loading:
 - 1. Seismic Design Category as Defined in the IBC: See Structural Drawings.
 - 2. Assigned Seismic Use Group or Building Category as Defined in the IBC: See Structural Drawings.
 - a. Component Importance Factor: (1.0) for all ductwork, equipment and piping, except propane piping which shall be (1.5).
 - b. Component Response Modification Factor: As required by IBC 2015 and ASCE 7-10 for specific component.

- c. Component Amplification Factor: As required by IBC 2015 and ASCE 7-10 for specific component.
- 3. Design Spectral Response Acceleration at Short Periods (0.2 Second): $S_d = 0.571$.
- 4. Design Spectral Response Acceleration at 1-Second Period: $S_{d1} = 0.268$.

1.5 SUBMITTALS

A. Product Data: For the following:

- 1. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
 - a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear.
 - b. Annotate to indicate application of each product submitted and compliance with requirements.
- 2. Interlocking Snubbers: Include ratings for horizontal, vertical, and combined loads.

B. Delegated-Design Submittal: For seismic-restraint details indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

- 1. Design Calculations: Calculate requirements for selecting seismic restraints. Certification documents to be signed and sealed by a qualified Professional Engineer with at least 5 years experience in the design of seismic restraints.
- 2. Seismic Restraint Details: Detail submittal drawings of seismic restraints and snubbers. Show anchorage details and indicate quantity, diameter, and depth of penetration anchors.
- 3. Seismic Shop Drawings: Floor Plans indicating seismic bracing locations and spacing for HVAC piping, ductwork and equipment.

1.6 QUALITY ASSURANCE

- A. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.
- B. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- C. Seismic restraint products shall be of the same manufacturer.
- D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

- E. All piping and ductwork is to be restrained to meet code requirements. The seismic restraint manufacturer will provide documentation on maximum restraint spacing for various cable sizes and anchors. In addition, the seismic restraint manufacturer will provide support documentation containing adequate information to allow the installation contractor to make reasonable field modifications to suit special case conditions.
- F. Seismic Restraint Designers/Manufacturers: Subject to compliance with requirements provide seismic design services and products by one of the following:
 - 1. Amber/Booth Co. Inc.
 - 2. Kinetics Noise Control.
 - 3. Mason Industries.
 - 4. Vibro Acoustics

PART 2 - PRODUCTS

2.1 RESTRAINED ISOLATORS

- A. Restrained Mounts: All-directional mountings with seismic restraint.
 - 1. Materials: Ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
 - 2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.
- B. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic or limit-stop restraint.
 - 1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to weight being removed; factory-drilled baseplate bonded to 1/4-inch thick, neoprene or rubber isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
 - 2. Restraint: Seismic or limit stop as required for equipment and authorities having jurisdiction.
 - 3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 - 4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 - 5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 - 6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.2 SEISMIC-RESTRAINT DEVICES

- A. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by an agency acceptable to authorities having jurisdiction.

1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.
- B. Snubbers: Factory fabricated using welded structural-steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.
 1. Anchor bolts for attaching to concrete shall be seismic-rated, drill-in, and stud-wedge or female-wedge type.
 2. Resilient Isolation Washers and Bushings: Oil- and water-resistant neoprene.
 3. Maximum 1/4-inch air gap, and minimum 1/4-inch thick resilient cushion.
- C. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.
- D. Restraint Cables: ASTM A 603 galvanized steel cables pre-stretched with end connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; and with a minimum of two clamping bolts for cable engagement.
- E. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections or reinforcing steel angle clamped to hanger rod.
- F. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.
- G. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.
- H. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.
- I. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.
- J. Adhesive Anchor Bolts: Drilled-in and capsule anchor system containing polyvinyl or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and equipment to receive seismic control devices for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

- A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.
- B. Hanger Rod Stiffeners: Install hanger rod stiffeners where indicated or scheduled on shop drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.
- C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.3 SEISMIC-RESTRAINT DEVICE INSTALLATION

- A. Installation of all seismic restraint materials shall be installed according to the manufacturer's installation instructions and project shop drawings.
- B. Equipment Restraints:
 - 1. Install seismic snubbers on HVAC equipment mounted on vibration isolators. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure. Snubbers are not needed if restrained isolators are used.
 - 2. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
 - 3. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.
- C. Piping Restraints:
 - 1. Comply with requirements in MSS SP-127.
 - 2. Space lateral supports and longitudinal supports as required for the site spectral response.
 - 3. Brace a change of direction longer than 12 feet.
- D. Install cables so they do not bend across edges of adjacent equipment or building structure.

- E. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.
- F. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.
- G. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
- H. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
- I. Drilled-in Anchors:
 - 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
 - 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
 - 3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
 - 4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
 - 5. Set anchors to manufacturer's recommended torque, using a torque wrench.
 - 6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment.

END OF SECTION 230549

SECTION 230553 - IDENTIFICATION FOR PLUMBING AND HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following mechanical identification materials and their installation:
 - 1. Equipment markers.
 - 2. Pipe markers.
 - 3. Valve tags.
 - 4. Valve schedules.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Valve numbering scheme.
- C. Valve Schedules: For each piping system. Furnish extra copies (in addition to mounted copies) to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. ASME Compliance: Comply with ASME A13.1, "Scheme for the Identification of Piping Systems," for letter size, length of color field, colors, and viewing angles of identification devices for piping.

1.5 COORDINATION

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

PART 2 - PRODUCTS

2.1 EQUIPMENT IDENTIFICATION DEVICES

- A. Equipment Markers: Engraved, color-coded laminated plastic. Include contact-type, permanent adhesive.
 - 1. Terminology: Match schedules as closely as possible.
 - 2. Data:
 - a. Name and plan number.
 - 3. Size: 2-1/2 by 4 inches for control devices, dampers, and valves; 4-1/2 by 6 inches for equipment.

2.2 PIPING IDENTIFICATION DEVICES

- A. Manufactured Pipe Markers, General: Preprinted, color-coded, with lettering indicating service, and showing direction of flow.
 - 1. Colors: Comply with ASME A13.1, unless otherwise indicated.
 - 2. Lettering: Use piping system terms indicated and abbreviate only as necessary for each application length.
 - 3. Pipes with OD, Including Insulation, Less Than 6 inches: Full-band pipe markers extending 360 degrees around pipe at each location.
 - 4. Pipes with OD, Including Insulation, 6 inches and Larger: Either full-band or strip-type pipe markers at least three times letter height and of length required for label.
 - 5. Arrows: Integral with piping system service lettering to accommodate both directions; or as separate unit on each pipe marker to indicate direction of flow.
- B. Pretensioned Pipe Markers: Precoiled semirigid plastic formed to cover full circumference of pipe and to attach to pipe without adhesive.
- C. Shaped Pipe Markers: Preformed semirigid plastic formed to partially cover circumference of pipe and to attach to pipe with mechanical fasteners that do not penetrate insulation vapor barrier.
- D. Self-Adhesive Pipe Markers: Plastic with pressure-sensitive, permanent-type, self-adhesive back.

2.3 VALVE TAGS

- A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers, with numbering scheme approved by Engineer. Provide 5/32-inch hole for fastener.
 - 1. Material: 0.032-inch thick brass or aluminum.
 - 2. Valve-Tag Fasteners: Brass wire-link or beaded chain; or S-hook.

2.4 VALVE SCHEDULES

- A. Valve Schedules: For each piping system, on standard-size 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.

PART 3 - EXECUTION

3.1 APPLICATIONS, GENERAL

- A. Products specified are for applications referenced in other related Sections. If more than single-type material, device, or label is specified for listed applications, selection is Installer's option.

3.2 EQUIPMENT IDENTIFICATION

- A. Install equipment markers with permanent adhesive on or near each major item of mechanical equipment.
 - 1. Letter Size: Minimum 1/4-inch for name of units if viewing distance is less than 24 inches, 1/2-inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 - 2. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.
 - 3. Locate markers where accessible and visible. Include markers for the following general categories of equipment:
 - a. Boilers.
 - b. Pumps and similar motor-driven units.
 - c. Tanks and pressure vessels.

3.3 PIPING IDENTIFICATION

- A. Install manufactured pipe markers indicating service on each piping system. Install with flow indication arrows showing direction of flow.
 - 1. Pipes with OD, Including Insulation, Less Than 6 inches: Self-adhesive pipe markers. Use color-coded, self-adhesive plastic tape, at least 3/4-inch wide, lapped at least 1-1/2 inches at both ends of pipe marker, and covering full circumference of pipe.
 - 2. Pipes with OD, Including Insulation, 6 inches and Larger: Self-adhesive pipe markers. Use color-coded, self-adhesive plastic tape, at least 1-1/2 inches wide, lapped at least 3 inches at both ends of pipe marker, and covering full circumference of pipe.
- B. Locate pipe markers where piping is exposed in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; exterior nonconcealed locations and concealed ceiling spaces 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 nonaccessible 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 each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings at intervals of 50 feet.

3.4 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; plumbing fixture supply stops; shutoff valves; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.
 1. Valve-Tag Size and Shape: 1-1/2 inches
 2. Valve-Tag Color: Natural Brass or Aluminum.

3.5 CLEANING

- A. Clean faces of mechanical identification devices.

END OF SECTION 230553

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes TAB to produce design objectives for all air and water systems.

1.3 SUBMITTALS

- A. Qualification Data: Within 30 days from Contractor's Notice to Proceed, submit 2 copies of evidence that TAB firm and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.
- B. Contract Documents Examination Report: Within 45 days from Contractor's Notice to Proceed, submit 2 copies of the Contract Documents review report as specified in Part 3.
- C. Sample Report Forms: Submit two sets of sample TAB report forms.

1.4 QUALITY ASSURANCE

- A. TAB Firm Qualifications: Engage a TAB firm certified by either AABC or NEBB.
- B. The Test and Balance Contractor shall be an independent consultant. The firm shall be independent of all Contractors including the Mechanical and Temperature Controls Contractor.
- C. Certification of TAB Reports: Certify TAB field data reports. This certification includes the following:
 - 1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
 - 2. Certify that TAB team complied with approved TAB plan and the procedures specified and referenced in this Specification.
- D. TAB Report Forms: Use standard forms from NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems." Or from SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing."
- E. Instrumentation Calibration: Calibrate instruments at least every six months or more frequently if required by instrument manufacturer.

1. Keep an updated record of instrument calibration that indicates date of calibration and the name of party performing instrument calibration.

1.5 COORDINATION

- A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist TAB activities.
- B. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.
- C. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.
 1. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.
- B. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Sections have been performed.
- C. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and that their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.
- D. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.
- E. Examine HVAC equipment to ensure that clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
- F. Examine strainers for clean screens and proper perforations.
- G. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.

- H. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- I. Examine system pumps to ensure absence of entrained air in the suction piping.
- J. Examine equipment for installation and for properly operating safety interlocks and controls.
- K. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

- A. Complete system readiness checks and submit a system readiness report to the Project Engineer. Verify the following:
 - 1. Permanent electrical power wiring is complete.
 - 2. Hydronic systems are filled, clean, and free of air.
 - 3. Hydronic systems specified to contain antifreeze have the correct percentage.
 - 4. Automatic temperature-control systems are operational.
 - 5. Equipment and duct access doors are securely closed.
 - 6. Isolating and balancing valves are open and control valves are operational.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" or SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and this Section.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to insulation Specifications for this Project.
- C. Mark equipment and balancing device settings with paint or other suitable, permanent identification material, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

3.4 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

- A. Prepare test reports with pertinent design data and number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against approved pump flow rate. Correct variations that exceed plus or minus 5 percent.
- B. Prepare hydronic systems for testing and balancing according to the following, in addition to the general preparation procedures specified above:
 - 1. Open all manual valves for maximum flow.
 - 2. Check expansion tank liquid level and system pressurization.
 - 3. Check flow-control valves for specified sequence of operation and set at indicated flow.

4. Set differential-pressure control valves at the specified differential pressure. Do not set at fully closed position when pump is positive-displacement type unless several terminal valves are kept open.
5. For hydronic systems containing antifreeze, note the product used and measure the actual concentration. Record final results on the TAB report.
6. Set system controls so automatic valves are wide open to heat exchangers.
7. Check pump-motor load. If motor is overloaded, throttle main flow-balancing device so motor nameplate rating is not exceeded.
8. Check air vents for a forceful liquid flow exiting from vents when manually operated.

3.5 TOLERANCES

- A. Set HVAC system airflow and water flow rates within the following tolerances:
 1. Heating-Water Flow Rate: 0 to minus 10 percent.

3.6 FINAL REPORT

- A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in three-ring binder, tabulated and divided into sections by tested and balanced systems.
- B. Include a certification sheet in front of binder signed by the testing and balancing engineer.
 1. Include a list of instruments used for procedures, along with proof of calibration.
- C. General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:
 1. Title page.
 2. Name and address of TAB firm.
 3. Project name.
 4. Project location.
 5. Architect's/Engineer's name and address.
 6. Contractor's name and address.
 7. Report date.
 8. Signature of TAB firm who certifies the report.
 9. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
 10. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
 11. Notes to explain why certain final data in the body of reports varies from indicated values.
 12. Test conditions for pump performance.

END OF SECTION 230593

SECTION 230700 - HVAC INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes pipe, duct, and equipment insulation.

1.2 SUBMITTALS

- A. Product data for each type of mechanical insulation identifying k-value, thickness, jackets (factory and field applied) and accessories.

1.3 COORDINATION

- A. Coordinate size and location of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application, duct Installer for duct installation application, and equipment Installer for equipment insulation application. Before preparing piping and ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation.

1.4 SEQUENCING AND SCHEDULING

- A. Schedule insulation application after pressure testing of piping and duct systems.
- B. Schedule insulation application after installation and testing of heat trace tape.
- C. Thermal-hanger shield inserts are specified in "Hangers and Supports." Inserts shall be installed at the time of hanger installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Glass Fiber:
 - a. CertainTeed Corporation.
 - b. Knauf Fiberglass.
 - c. Manville/Schuller.

- d. Owens-Corning Fiberglas Corporation.
 - e. E-Insulation.
2. Flexible Elastomeric Cellular:
- a. Armacell LLC.
 - b. IMCOA Corporation.
 - c. Rubatex Corporation.

2.2 GLASS FIBER

- A. Material: Inorganic glass fibers, bonded with a thermosetting resin.
- B. Jacket: All-service, factory-applied, laminated glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil skim backing having pressure sensitive self-sealing lap.
- C. Board: ASTM C 612, Class 2, semi-rigid jacketed board.
 - 1. Thermal Conductivity: 0.23 average maximum, at 75 deg F mean temperature.
 - 2. Density: 3.0 pcf average maximum.
- D. Blanket: ASTM C 553, Type I, Class B-2, jacketed flexible blankets.
 - 1. Thermal Conductivity: 0.27 at compressed thickness, at 75 deg F mean temperature.
 - 2. Density: 0.75lb/cu. ft.
- E. Preformed Pipe Insulation: ASTM C 547, Class 1, rigid pipe insulation, factory applied all-service jacket with self seal lap.
 - 1. Thermal Conductivity: 0.26 average maximum at 75 deg F mean temperature.
 - 2. Density: 5 lb/cu. ft average maximum.
- F. Vapor Barrier Coating: Waterproof coating recommended by insulation manufacturer for outside service.

2.3 FLEXIBLE ELASTOMERIC CELLULAR

- A. Material: Flexible expanded closed-cell structure with smooth skin on both sides.
 - 1. Tubular Materials: ASTM C 534, Type I.
 - 2. Sheet Materials: ASTM C 534, Type II.
- B. Thermal Conductivity: 0.25 average maximum at 75 deg F.
- C. Coating: Water based latex enamel coating recommended by insulation manufacturer.

2.4 ADHESIVES

- A. Flexible Elastomeric Cellular Insulation Adhesive: Solvent-based, contact adhesive recommended by insulation manufacturer. Comply with MIL-A-24179A, Type II, Class 1.

2.5 FIELD APPLIED JACKETS

- A. PVC Jacketing: High-impact, ultra-violet-resistant PVC, 30-mils thick, roll stock ready for shop or field cutting and forming to indicated sizes.

- 1. Mastic/Adhesive: As recommended by insulation manufacturer.

- B. PVC Fitting Covers: Factory-fabricated fitting covers manufactured from 30-mil-thick, high-impact, ultra-violet-resistant PVC.

- 1. Mastic around fitting to pipe insulation.

2.6 ACCESSORIES AND ATTACHMENTS

- A. Bands: 3/4-inch wide, in one of the following materials compatible with jacket:

- 1. Aluminum: 0.007-inch thick.
 - 2. 1/8-inch by 1/8-inch Rapid Penetrating point screws for non vapor barrier application.

- B. Wire: 14 gauge nickel copper alloy, 16 gauge, soft-annealed stainless steel, or 160 gauge, soft-annealed galvanized steel.

- C. Cupped Head Weld Pins- 1-1/2 inch diameter cupped head, mild, annealed steel with zinc plating.

- D. Corner Angles: 28 gauge, 1 inch by 1 inch aluminum, adhered to 2 inch by 2 inch kraft paper.

- E. Anchor Pins: Capable of supporting 20 pounds each. Provide anchor pins and speed washers of sizes and diameters as recommended by the manufacturer for insulation type and thickness.

- F. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136 and UL listed.

- 1. Width: 3 inches.
 - 2. Thickness: 11.5 mils.
 - 3. Adhesion: 90 ounces force/inch in width.
 - 4. Elongation: 2 percent.
 - 5. Tensile Strength: 40 lbf/inch in width.
 - 6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

- G. Foil/Skrim/Kraft Tape: Vapor barrier tape with rubber adhesive and UL listed and 25/20 rated.

- 1. Width: 2 inches.
 - 2. Thickness: 3.7 mils.
 - 3. Adhesion: 85 ounces force/inch in width.
 - 4. Elongation: 5 percent.
 - 5. Tensile Strength: 45 lbf/inch in width.

2.7 SEALING COMPOUNDS-MASTIC

- A. Vapor Barrier Compound: Water-based, fire-resistive composition.
 - 1. Water Vapor Permeance: 0.08 perm maximum.
 - 2. Temperature Range: Minus 20 to 180 deg F.
- B. Weatherproof Sealant: Flexible-elastomer-based, vapor-barrier sealant designed to seal metal joints.
 - 1. Water Vapor Permeance: 0.02 perm maximum.
 - 2. Temperature Range: Minus 50 to 250 deg F.
 - 3. Color: Aluminum.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Preparation: Clean, dry, and remove foreign materials such as rust, scale, and dirt.

3.2 INSTALLATION, GENERAL

- A. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each mechanical system.
- B. Select accessories compatible with materials suitable for the service. Select accessories that do not corrode, soften, or otherwise attack the insulation or jacket in either the wet or dry state.
- C. Install vapor barriers on insulated pipes, ducts, and equipment where indicated and defined in insulation service chart.
- D. Apply insulation material, accessories, and finishes according to the manufacturer's printed instructions.
- E. Seal joints and seams to maintain vapor barrier on insulation requiring a vapor barrier.
- F. Seal penetrations for hangers, supports, anchors, and other projections in insulation requiring a vapor barrier.
- G. Keep insulation materials dry during application and finishing.
- H. Items Not Insulated: Unless otherwise indicated do not apply insulation to the following systems, materials, and equipment:
 - 1. Metal ducts with duct liner.
 - 2. Flexible connectors for ducts and pipes.
 - 3. Testing laboratory labels and stamps.
 - 4. Nameplates and data plates.
 - 5. Access panels and doors in air distribution systems.

6. Chrome-plated pipes and fittings, except for plumbing fixtures for the disabled.
7. Backflow prevention device.

3.3 PIPE INSULATION INSTALLATION, GENERAL

- A. Tightly butt longitudinal seams and end joints.
- B. Apply insulation continuously over fittings, valves, and specialties.
- C. Apply insulation with a minimum number of joints.
- D. Apply insulation with all service jackets as follows:
 1. Pull jacket tight and smooth.
 2. Cover circumferential joints with butt strips, at least 3 inches wide, and of same material as insulation jacket.
 3. Longitudinal Seams: Overlap seams at least 1-1/2-inches. Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap.
 4. At penetrations in jackets for thermometers and pressure gauges, fill and seal voids with mastic.
 5. Repair damaged insulation jackets, except metal jackets, by applying jacket material around damaged jacket. Extend patch at least 2 inches in both directions beyond damaged insulation jacket and around the entire circumference of the pipe.
- E. Roof Penetrations: Apply insulation for interior applications to a point even with the top of the roof flashing. Seal with vapor barrier coating. Apply insulation for exterior applications butted tightly to interior insulation ends. Extend metal jacket for exterior insulation outside roof flashing at least 2 inches below top of roof flashing. Seal metal jacket to roof flashing with vapor barrier coating.
- F. Exterior Wall Penetrations: For penetrations of below grade exterior walls, terminate insulation flush with mechanical sleeve seal. Seal terminations with vapor barrier coating.
- G. Interior Walls and Partitions Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions.
- H. Flanges, Fittings, and Valves - Interior Exposed and Concealed: Coat pipe insulation ends with mastic. Apply premolded, precut, or field-fabricated segments of insulation around flanges, unions, valves, and fittings. Make joints tight.
 1. Use same material and thickness as adjacent pipe insulation.
 2. Overlap nesting insulation by 2 inches or 1-pipe diameter, which ever is greater.
 3. Insulate elbows with blanket insulation inserts.
 4. Cover insulation, except for metal jacketed insulation, with PVC fitting covers and seal circumferential joints with butt strips.
- I. Hangers and Anchors: Apply insulation continuously through hangers and around anchor attachments. For vapor barrier application piping, extend insulation on anchor legs a minimum of 12 inches and taper and seal insulation ends.

1. Install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer. Refer to "Hangers and Supports" for thermal-hanger shield inserts.
2. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

3.4 GLASS FIBER PIPE INSULATION INSTALLATION

- A. Seal exposed seams and joint ends, with mastic.

3.5 FLEXIBLE ELASTOMERIC PIPE INSULATION INSTALLATION

- A. Slip insulation on the pipe before making connections wherever possible. Seal joints with adhesive. Where the slip-on technique is not possible, use longitudinally precut insulation and apply to the pipe. Seal seams and joints with adhesive.
- B. Valves, Fittings, and Flanges: Cut insulation segments from pipe or sheet insulation. Bond to valve, fitting, and flange and seal joints with adhesive. Use prefabricated fittings if available.
 1. Miter cut materials to cover soldered elbows and tees.
 2. Fabricate sleeve fitting covers from flexible elastomeric cellular insulation for screwed valves, fittings, and specialties. Miter cut materials. Overlap adjoining pipe insulation.

3.6 EQUIPMENT INSULATION INSTALLATION, GENERAL

- A. Install board materials with a minimum number of joints.
- B. Ensure insulation materials to fit as closely as possible to the equipment and to fit contours of equipment. Stagger end joints.
- C. Insulation Thicknesses Greater than 2 inches: Install insulation in multiple layers with staggered joints.
- D. Secure sections of insulation in place with bands spaced at 12 inch centers, except for flexible elastomeric cellular insulation.
- E. Protect exposed corners with corner angles under bands.
- F. Manholes, Handholes, and Information Plates: Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.
- G. Removable Insulation: Install insulation on components that require periodic inspecting, cleaning, and repairing for easy removal and replacement without damage to adjacent insulation.
- H. Finishing: Except for flexible elastomeric cellular insulation, see Insulation schedule for jacketing.

3.7 GLASS FIBER EQUIPMENT INSULATION INSTALLATION

- A. Secure insulation with anchor pins and speed washers.
- B. Space anchors at maximum intervals of 18 inches in both directions and not more than 3 inches from edges and joints.

3.8 FLEXIBLE ELASTOMERIC EQUIPMENT INSULATION INSTALLATION

- A. Install sheets of the largest manageable size.
- B. Apply full coverage of adhesive to the surfaces of the equipment and to the insulation.
- C. Butt insulation joints firmly together and apply adhesive to insulation edges at joints.
- D. Coat exterior installations with manufacturer's coating and install by manufacturer's installation instructions.

3.9 DUCT INSULATION

- A. Blanket Insulation: Install tight and smooth. Secure to ducts having long sides or diameters as follows:
 - 1. 24 Inches and Larger: Anchor pins spaced 12 inches apart each way.
 - 2. Overlap joints 3 inches.
 - 3. Seal joints, breaks, and punctures with vapor barrier tape, matching jacket material.

3.10 FIELD APPLIED JACKETS

- A. Install the PVC jacket with 1 inch overlap at longitudinal and butt joints and seal with adhesive.

3.11 FINISHES

- A. Flexible Elastomeric Cellular Insulation: After adhesive has fully cured, apply 2 coats of manufacturer's recommended protective coating to exposed insulation.

3.12 INSULATION SCHEDULES

- A. General: Abbreviations used in the following schedules include:
 - 1. Field-Applied Jackets: PVC - PVC, A - Aluminum, SS - Stainless Steel, Glass Cloth.
 - 2. Pipe Sizes: NPS - Nominal Pipe Size.
 - 3. Materials: GF - Glass Fiber, FE - Flexible Elastomeric, CG - Cellular Glass, CS - Calcium Silicate, FPS - Fire Protection System.
- B. Pipe Insulation:

APPLICATION	TEMP (°F)	NOM. PIPE SIZE (IN.)	INSUL. MAT.	THICKNESS (IN.)	INSERTS OR SHIELDS NOTE 1	VAPOR BARR.	FIELD APP. JKT.
DOMESTIC COLD WATER	ALL	ALL	GF or FE	1	NO	YES	NONE
HEATING WATER SUPPLY AND RETURN	141 - 200	1/2 TO 1-1/4	GF	1-1/2	YES	NO	NONE
GLYCOL SUPPLY AND RETURN		1-1/2 AND UP	GF	2			

NOTE 1: INSERTS AND SHIELDS ARE IN SECTION 230529 - HANGERS AND SUPPORTS FOR PLUMBING AND HVAC PIPING AND EQUIPMENT AND SHALL BE PROVIDED BY THE INSULATION CONTRACTOR.

C. Equipment Insulation:

APPLICATION	TYPE	INSUL. MAT.	THICKNESS (IN.)	VAPOR BARRIER	FIELD APPLIED JACKET
HOT EQUIPMENT, TANKS, BUFFER TANK, AIR SEPARATORS, HEAT EXCHANGERS	BOARD	GF	2	NO	GC

D. Duct Systems:

APPLICATION	TYPE	INSUL. MAT.	THICKNESS (IN.)	VAPOR BARRIER	FIELD APPLIED JACKET
COMBUSTION AIR DUCTS FROM LOUVER TO OUTLET AND FROM TERMINATION CAP TO RADIANT HEATER	BLANKET	GF	1-1/2	NO	NONE

BOILER COMBUSTION AIR DUCT BEHIND LOUVER	BOARD	GF	1-1/2	NO	NONE
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END OF SECTION 230700

SECTION 232113 - HYDRONIC 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. This Section includes piping, special-duty valves, and hydronic specialties for hot-water heating systems; makeup water for these systems; and blowdown drain lines.

1.3 SUBMITTALS

- A. Product Data: For each type of special-duty valve indicated. Include flow and pressure drop curves based on manufacturer's testing for diverting fittings, calibrated balancing valves, and automatic flow-control valves.
- B. Shop Drawings: Detail fabrication of pipe anchors, hangers, special pipe support and anchor assemblies, alignment guides, expansion joints and loops, and their attachment to the building structure.
- C. Field Test Reports: Written reports of tests specified in Part 3 of this Section. Include the following:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Failed test results and corrective action taken to achieve requirements.
- D. Maintenance Data: For hydronic specialties and special-duty valves to include in maintenance manuals specified in Division 01.
- E. Chemical Treatment: Product Data on Glycol, Glycol Feeders, Bypass Feeders and proposed system inhibitors.
- F. Press Seal Joint Installation Training Certificates.

1.4 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- C. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 01.

1.5 EXTRA MATERIALS

- A. Water-Treatment Chemicals: Furnish enough chemicals for initial system startup and for preventive maintenance for one year from date of Substantial Completion.

1.6 WARRANTY

- A. Manufacturer's Warranty for Hydronic Piping: Manufacturer's standard 25 year warranty for PEX-a piping and ASTM F 1960 fittings.
- B. Manufacturer's Warranty for Pre-Insulated Pipe Distribution Systems: Submit, for owner's acceptance, USA manufacturer's standard 5-year warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights owner may have under contract documents.
- C. Warranty covers the repair or replacement of any piping or fittings proven defective.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

- A. Drawn-Temper Copper Tubing: ASTM B 88, Type L.
- B. Copper or Bronze Pressure-Seal Fittings:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Elkhart Products Corporation.
 - b. NIBCO, Inc.
 - c. Tyco GRINNELL.
 - d. Viega.
 2. Housing: Copper.
 3. O-Rings and Pipe Stops: EPDM.
 4. Tools: Manufacturer's special tools.
 5. Minimum 200 psig working-pressure rating at 250 deg F.
- C. Wrought-Copper Unions: ASME B16.22.

2.2 STEEL PIPE AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; type, grade, and wall thickness as indicated in Part 3 "Piping Applications" Article.
- B. Cast-Iron Threaded Fittings: ASME B16.4; Classes 125 and 250 as indicated in Part 3 "Piping Applications" Article.
- C. Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300 as indicated in Part 3 "Piping Applications" Article.
- D. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in Part 3 "Piping Applications" Article.
- E. Cast-Iron Pipe Flanges and Flanged Fittings: ASME B16.1, Classes 25, 125, and 250; raised ground face, and bolt holes spot faced as indicated in Part 3 "Piping Applications" Article.
- F. Wrought-Steel Fittings: ASTM A 234/A 234M, wall thickness to match adjoining pipe.
- G. Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
 - 1. Material Group: 1.1.
 - 2. End Connections: Butt welding.
 - 3. Facings: Raised face.
- H. Steel Pipe Nipples: ASTM A 733, made of same materials and wall thicknesses as pipe in which they are installed.

2.3 PLASTIC PIPE AND FITTINGS

- A. Polypropylene Pipe: Pipe shall be manufactured from a PP-R or PP-RCT resin meeting requirements of ASTM F 2389. The pipe shall contain no recycled materials. All pipe shall be made in a three layer extrusion process. Heating piping shall contain a fiber layer (Faser) to restrict thermal expansion. Pipe shall be certified by NSF International complying with NSF 14. Piping shall contain an oxygen barrier. Pipe shall have a minimum SDR rating of 11 or heavier and conform with maximum pressure rating of connected system.
 - 1. Manufacturers: Subject to compliance with requirements, polypropylene pipe shall be manufactured by one of the following:
 - a. Aquatherm.
 - b. Nupi Americas of Houston, TX.
 - 2. Fittings: Manufactured of polypropylene resin in conformance with ASTM F2389 and NSF 14. Fittings and joints shall be socket fusion, electrofusion or butt-fusion type, made in accordance with manufacturer's installation requirements.
 - 3. Smoke and Fire Ratings: Where indicated on the Drawings that a Plenum-rated Piping System is needed, then the pipe shall be wrapped and/or insulated with standard pipe insulation, field installed. The pipe wrap or insulation shall meet the requirements of

- CAN/ULC-S102.2-03 or ASTM E 84. The system shall have a Flame Spread Classification of less than 25 and Smoke Development rating of less than 50.
4. UV Protection: Where indicated on the Drawings and as scheduled by the Contractor that the pipe will be exposed to direct UV light for more than 30 days, it shall be provided with a factory-applied, UV-resistant coating or alternative UV protection.
 5. Manufacturers Standard Colors: Polypropylene piping may be pigmented in different colors identifying the pipe application.
 6. Polypropylene piping shall warranty pipe and fittings for 10 years to be free of defects in materials. Warranty shall cover all labor and material costs of repairing and replacing defective materials.
- B. PEX-a (Engle-method Crosslinked Polyethylene) Piping: ASTM 876 with oxygen-diffusion barrier that meets DIN 4726.
1. Manufacturers: Subject to compliance with requirements, PEX-a pipe shall be manufactured by one of the following:
 - a. Uponor.
 2. PEX-a piping and fittings shall meet the following pressure and temperature ratings:
 - a. 200 degrees F (93 degrees C) at 80 psi (551 kPa).
 - b. 180 degrees F (82 degrees C) at 100 psi (689 kPa).
 - c. 73.4 degrees F (23 degrees C) at 160 psi (1,102 kPa).
 3. PEX-a Fittings, Elbows and Tees (1/2 inch through 3 inch nominal pipe size): ASTM F1960 cold-expansion fitting manufactured from the following material types:
 - a. UNS No. C69300 Lead-free (LF) Brass.
 - b. 20 percent glass-filled polysulfone as specified in ASTM D6394.
 - c. Unreinforced polysulfone (group 01, class 1, grade 2) as specified in ASTM D6394.
 - d. Polyphenylsulfone (group 03, class 1, grade 2) as specified in ASTM D6394
 - e. Blend of polyphenylsulfone (55-80%) and unreinforced polysulfone (rem.) as specified in ASTM D6394.
 - f. Reinforcing cold-expansion rings shall be manufactured from the same source as PEX-a piping manufacturer and marked "F1960".
 4. PEX-a Fittings (1 inch through 4 inch nominal pipe size): SDR9 compression type fitting consisting of a double O-ring insert with a compression sleeve tightened around the pipe and insert.
 5. Plastic-to-Metal Transition Fittings:
 - a. Manufacturer: Provide fittings from the same manufacturer of the piping.
 - b. Threaded Brass to PEX-a Transition: One-piece brass fitting with male or female threaded adapter and F1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring. Typically used for PEX sizes 3 inch and below.
 - c. Brass Sweat to PEX-a Transition: One-piece brass fitting with sweat adapter and F1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring. Typically used for PEX sizes 3 inch and below.
 - d. Dezincification-resistant (DZR) Brass to PEX-a Transition: Male NPT thread and PEX compression fitting. Editor: Typically used for PEX sizes 1 inch through 4 inch.
 6. Plastic-to-Metal Transition Unions:
 - a. Manufacturer: Provide unions from the same manufacturer of the piping.
 - b. Threaded Brass to PEX-a Union: One-piece brass fitting with male or female threaded adapter and F1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring. Typically used for PEX sizes 3 inch and below.

- c. Brass Sweat to PEX-a Union: One-piece brass fitting with sweat adapter and F1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring. Typically used for PEX sizes 3 inch and below.

- C. Pre-insulated PEX Thermal Distribution System: PEX-a service tubing is USA manufactured and tested in accordance with ASTM F876, ASTM F877, ASTM F1960, CSA B137.5 and NSF-rfh.
 - 1. Manufacturers: Subject to compliance with requirements, Pre-insulated PEX Thermal Distribution System shall be manufactured by one of the following:
 - a. Uponor.
 - 2. The PEX service tubing has hydrostatic ratings in accordance with the temperatures and pressures listed in the ASTM standard. The hydrostatic ratings are:
 - a. 200 degrees F (93 degrees C) at 80 PSI (551 kPa).
 - b. 180 degrees F (82 degrees C) at 100 PSI (689 kPa).
 - c. 73.4 degrees F (23 degrees C) at 160 psi (1102 kPa).
 - 3. Service Tubing:
 - a. Material: Crosslinked polyethylene (PEX) manufactured to PEX-a or Engel-method standard
 - b. Material Standard: Manufactured in accordance with ASTM F876 and F877
 - c. Pressure Ratings: Hydrostatic design and pressure ratings are in accordance with the ASTM standard. Operating limits are as follows.
 - d. -58 degrees F to 203 degrees F at 80 psi (-50 degrees C to 95 degrees C at 551 kPa).
 - e. The PEX service tubing pipe has an oxygen diffusion barrier that does not exceed an oxygen diffusion rate of 0.10 grams per cubic meter per day at 104 degrees F (40 degrees C) water temperature in accordance with German DIN 4726.
 - f. Nominal Inside Diameter: Provide tubing with nominal inside diameter in accordance with ASTM F876, as indicated. Note: Numbers in brackets are the metric equivalent pipe size.
 - 1) 1 inch (25mm).
 - 2) 1-1/4 inch (32mm).
 - 3) 1-1/2 inch (40mm).
 - 4) 2 inch (50mm).
 - 5) 2-1/2 inch (63mm).
 - 6) 3 inch (75mm).
 - 7) 3-1/2 inch (90mm).
 - 8) 4 inch (110mm).
 - 4. Outer Jacket:
 - a. Material: Corrugated seamless high-density polyethylene (HDPE)
 - b. The HDPE jacket completely encompasses and protects the insulation from moisture and damage.
 - c. Outer jacket shall be extruded directly over the insulation and is flexible.
 - d. The outer jacket shall contain 2 percent carbon black, finely divided and thoroughly dispersed to provide protection from UV degradation.
 - e. Minimum Bend Radius:
 - 1) 1 inch pre-insulated tubing with 5.5-inch (140mm) jacket has a bend radius of 10 inches (254mm).
 - 2) 1-1/4 inch pre-insulated tubing with 5.5-inch (140mm) jacket has a bend radius of 12 inches (304mm).
 - 3) 1-1/2 inch pre-insulated tubing with 6.9-inch (175mm) jacket has a bend radius of 16 inches (406mm).

- 4) 2 inch pre-insulated tubing with 6.9-inch (175mm) jacket has a bend radius of 18 inches (457mm).
 - 5) 2-1/2 inch pre-insulated tubing with 6.9-inch (175mm) jacket has a bend radius of 30 inches (762mm).
 - 6) 3 inch pre-insulated tubing with 7.9-inch (200mm) jacket has a bend radius of 32 inches (812mm).
 - 7) 3-1/2 inch pre-insulated tubing with 7.9-inch (200mm) jacket has a bend radius of 44 inches (1117mm).
 - 8) 4 inch pre-insulated tubing with 7.9-inch (200mm) jacket has a bend radius of 48 inches (1219mm).
5. Insulation:
 - a. The insulation shall be layered expanded crosslinked water-resistant polyethylene closed-cell foam.
 - b. All seams of the insulation shall be sealed.
 - c. Insulation shall not be bonded to the service tubing.
 6. End Seals:
 - a. The piping manufacturer will supply all EPDM rubber end caps with water-stop seal.
 - b. EPDM rubber end caps are to be installed on each end prior to connecting the service pipes and insulating the field joints.
 - c. The EPDM end caps will seal onto the tubing and outer jacket forming a watertight seal.
 7. Cold Expansion Fittings for PEX-a Service Tubing:
 - a. For system compatibility, use fittings offered by the tubing manufacturer.
 - b. Fittings must comply with the performance requirements of ASTM F877.
 - c. Fittings are to be manufactured in accordance with ASTM F1960.
 - d. The fitting assembly consists of a barbed adapter and an applicable-sized PEX ring.
 - e. All buried fittings will be installed, insulated, and sealed in accordance with the instructions of the piping manufacturer.
 8. Compression Fittings for PEX-a Service Tubing:
 - a. For system compatibility, use fittings offered by the tubing manufacturer.
 - b. Fittings are to be manufactured from dezincification-resistant brass and lead-free brass.
 - c. The fitting assembly must comply with performance requirements of ASTM F877.
 - d. Fittings will consist of a compression fitting with a coupling sleeve, a fitting body insert with o-ring(s) and a bolt and nut.
 - e. All buried fittings will be installed, insulated, and sealed in accordance with the piping manufacturer's instructions.
 9. Male NPT thread for each compression fitting is shown below.
 - a. 1 inch PEX compression fitting has 1-inch male NPT thread.
 - b. 1-1/4 inch PEX compression fitting has 1-1/4 inch male NPT thread.
 - c. 1-1/2 inch PEX compression fitting has 1-1/2 inch male NPT thread.
 - d. 2 inch PEX compression fitting has 2 inch male NPT thread.
 - e. 2-1/2 inch PEX compression fitting has 2 inch male NPT thread.
 - f. 3 inch PEX compression fitting has 2-1/2 inch male NPT thread.
 - g. 3-1/2 inch PEX compression fitting has 3 inch male NPT thread.
 - h. 4 inch PEX compression fitting has 4 inch male NPT thread.
 10. All transition fittings connecting to the compression fittings will be manufactured of dezincification-resistant brass.

11. Pipe and Fitting Identification: The pipe shall be marked in accordance with the standards to which it is manufactured.
 - a. Color identification by the use of stripes on pipe to identify pipe service shall be optional. If used, stripes or colored exterior pipe product shall be blue for potable water, green for wastewater/sewage, or purple for reclaimed water.
 - b. Tracing wire shall be placed parallel and 18 inches above, but separate from, the pipe and shall be 10 AWG.
 - c. Marking tape shall be approved by the engineer and placed between 12 and 18 inches above the crown of the pipe.
12. Accessories: Use accessories associated with the installation of the piping system as recommended by or available from the manufacturer.
13. Insulation Kits: Insulation kits will be manufactured of ABS shells or HDPE sleeves, will feature equal thickness of closed-cell PEX insulation as the pipe, and sealed watertight.
14. Connection Vaults:
 - a. The piping manufacturer will provide the connection vaults when required by the project construction.
 - b. Connection vaults shall be constructed of rotationally molded composite polyethylene and PE foam, providing a structurally sound and thermally insulated chamber.
 - c. Heat shrink seals as provided by the tubing manufacturer shall be installed to prevent introduction of water into the vault.
15. Anchors: The project engineer will determine the use of anchors, if required, within the distribution system.

2.4 JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
- B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
 1. Manufacturers:
 - a. Date Y No. 10.
 - b. Dutton Nokorode No. 290.
 - c. Dutton Nokorode No. 292.
 - d. Kester No. 720.
 - e. LA-CO Flux-Rite 90.
 - f. Superior No. 142.
 - g. Superior No. 146.

- D. Gasket Material: Thickness, material, and type suitable for fluid to be handled and working temperatures and pressures.

2.5 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper-alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.

2.6 VALVES

- A. Globe, Check, Ball, and Butterfly Valves: Comply with requirements specified in Division 23 Section "General-Duty Valves for HVAC Piping."

- B. Bronze, Calibrated-Orifice, Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Armstrong Pumps, Inc.
 - b. Bell & Gossett Domestic Pump; a division of ITT Industries.
 - c. Flow Design Inc.
 - d. Gerand Engineering Co.
 - e. Griswold Controls.
 - f. Nexus Valves.
 - g. Taco.
2. Body: Bronze, ball, globe or plug type with calibrated orifice or venturi.
3. Ball: Brass or stainless steel.
4. Plug: Resin.
5. Seat: PTFE.
6. End Connections: Threaded or socket.
7. Pressure Gage Connections: Integral seals for portable differential pressure meter.
8. Handle Style: Lever, with memory stop to retain set position.
9. CWP Rating: Minimum 125 psig.
10. Maximum Operating Temperature: 250 deg F.

- C. Diaphragm-Operated Safety Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Amtrol, Inc.
 - b. Armstrong Pumps, Inc.
 - c. Bell & Gossett Domestic Pump; a division of ITT Industries.
 - d. Conbraco Industries, Inc.

- e. Spence Engineering Company, Inc.
 - f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Body: Bronze or brass.
 3. Disc: Glass and carbon-filled PTFE.
 4. Seat: Brass.
 5. Stem Seals: EPDM O-rings.
 6. Diaphragm: EPT.
 7. Wetted, Internal Work Parts: Brass and rubber.
 8. Valve Seat and Stem: Noncorrosive.
 9. Valve Size, Capacity, and Operating Pressure: Comply with ASME Boiler and Pressure Vessel Code: Section IV, and selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

2.7 AIR CONTROL DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Amtrol, Inc.
 2. Armstrong Pumps, Inc.
 3. Bell & Gossett Domestic Pump; a division of ITT Industries.
 4. Spirotherm.
 5. Taco.
- B. High Capacity Air Vent: Cast iron body with stainless steel, brass and EPDM interval components. Float actuated air vent designed to purge air from hydronic systems. Provide shutoff at pressures up to 150 psig at a maximum temperature of 250 deg F.
- C. Manual Air Vents:
 1. Body: Bronze.
 2. Internal Parts: Nonferrous.
 3. Operator: Screwdriver or thumbscrew.
 4. Inlet Connection: NPS 1/2.
 5. Discharge Connection: NPS 1/8.
 6. CWP Rating: 150 psig.
 7. Maximum Operating Temperature: 225 deg F.
- D. Bladder-Type Expansion Tanks:
 1. Tank: Welded steel, rated for 125 psig working pressure and 375 deg F maximum operating temperature. Factory test with taps fabricated and supports installed and labeled according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 01.
 2. Bladder: Securely sealed into tank to separate air charge from system water to maintain required expansion capacity.
 3. Air-Charge Fittings: Schrader valve, stainless steel with EPDM seats.
- E. In-Line Air Separators:

1. Tank: One-piece cast iron with an integral weir constructed to decelerate system flow to maximize air separation.
2. Maximum Working Pressure: Up to 175 psig.
3. Maximum Operating Temperature: Up to 300 deg F.

2.8 CHEMICAL TREATMENT

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. By-Pass Chemical Feeders:
 - a. Culligan USA.
 - b. J.L. Wingert.
 - c. John Wood.
 - d. Vulcan Laboratories, Subsidiary of Clow Corp.
 - e. Vector Industries.
 - f. Claypool Pump and Machinery.
2. Inhibited Glycol-Based Heat Transfer Fluids:
 - a. Dow Chemical Co. (systems without cast aluminum heat exchangers)
 - b. Huntsman. (systems without cast aluminum heat exchangers)
3. Industrial Grade Glycol:
 - a. Chemical Specialties.
 - b. Dow Chemical.
 - c. Huntsman.
 - d. Hubbard-Hall.
 - e. Hydrite Chemical Co.
 - f. Kost-USA.
 - g. MIL-SPEC Industries.
4. Glycol Feeder Assembly:
 - a. Advantage Controls.
 - b. Armstrong Pumps.
 - c. Axiom.
 - d. ExpanFlex.
 - e. Sage Industries, Inc.
 - f. Wessels.

B. Inhibited Propylene Glycol-Based Heat Transfer Fluids: Heat transfer fluid specifically designed for closed-loop HVAC systems, low toxicity, dyed to facilitate leak detection, and industrially inhibited. The inhibitor system shall be designed to protect brass, copper, solder, steel, cast iron and other metals commonly found in industrial cooling and heating systems. The fluid shall include phosphate and tolyltriazole inhibitors. Product shall be JEFFCOOL P150; DOWFROST-HD or approved equal.

1. Provide heat transfer fluid with propylene glycol concentration for burst protection to -20 deg F.
 2. When make-up water hardness is greater than 100 PPM the concentrate shall be mixed with distilled or deionized water to achieve proper burst protection.
 3. When levels of chlorides, sulfates, calcium, magnesium in make-up water are greater than 25 PPM each, the concentrate shall be mixed with distilled or deionized water to achieve proper burst protection.
- C. Industrial Grade Propylene or Ethylene Glycol: Industrial Propylene glycol mixed with water to obtain the specified burst protection. The approved chemical treatment supplier shall perform a chemical analysis to determine the make-up water characteristics and add proper inhibitors to protect brass, copper, solder, steel, cast iron, and other metals in the piping system. When levels of chlorides, sulfates, calcium, magnesium in make-up water are greater than 25 ppm each or the hardness of the water is greater than 100 ppm the industrial glycol solution and inhibitors shall be mixed with distilled or deionized water.
- D. Glycol Feeder Assembly: Provide a complete factory packaged automatically controlled antifreeze feeder assembly. Package shall be factory assembled and tested including 50 gal clear polyethylene tank, 115 volt, 1 phase positive displacement pump, controls, pressure switch, pressure relief valve, pressure gauge, tank drain valve, interconnecting piping and supporting legs and pads. Controls shall include "pump run" and "low level" colored lights, "push to test" and "alarm silence" buttons and an audible alarm. Assembly shall require only one 115V, 1 phase plug in power cord. The pressure switch shall detect a drop in hydronic system pressure which will activate pump to refill system from premixed glycol/water solution in tank. Assembly shall be Sage Industries Model WC-0202 or equal.
- E. Bypass Chemical Feeder: Welded steel construction; 125 psig working pressure; 5-gal. capacity; with fill funnel and inlet, outlet, and drain valves.
1. Chemicals: Specially formulated, based on analysis of makeup water, to prevent accumulation of scale and corrosion in piping and connected equipment.

2.9 HYDRONIC PIPING SPECIALTIES

- A. Y-Pattern Strainers:
1. Manufacturers:
 - a. Armstrong Machine Works.
 - b. Guston Bacon.
 - c. Hoffman Specialty.
 - d. Metraflex Co.
 - e. Nexus Valves.
 - f. Nibco.
 - g. Spirax Sarco.
 - h. Tyco GRINNELL.
 - i. Victaulic Co. of America.
 - j. Watts Regulator Co.
 - k. Wheatley.

2. Bronze 3 inches and smaller:
 - a. Body: ASTM B584 or B62 bronze.
 - b. End Connections: Threaded or soldered ends.
 - c. Strainer Screen: 20 mesh type, 304 stainless steel or 0.033 inch perforated type 304 stainless steel screen.
 - d. CWP Rating: 125 psig.
3. Iron 3 inches and smaller:
 - a. Body: ASTM A126, Class B, Cast iron with bottom drain connection.
 - b. End Connections: Threaded.
 - c. Strainer screen: Stainless steel.
 - d. CWP Rating: 125 psig.
4. Iron 2-1/2 and larger:
 - a. Body: ASTM A126, Class B cast iron with bolted cover and bottom drain connection.
 - b. End Connections: Flanged or grooved end.
 - c. Strainer Screen: Stainless steel.
 - d. CWP Rating: 125 psig.
5. End Connections: Threaded ends for NPS 2 and smaller; flanged or grooved ends for NPS 2-1/2 and larger.
6. Strainer Screen: 40-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
7. CWP Rating: 125 psig.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Hot-water heating piping and glycol piping, aboveground, NPS 2 and smaller, shall be one of the following:
 1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered or pressure-seal joints.
 2. Schedule 40 steel pipe; Class 150, malleable-iron fittings; cast-iron flanges and flange fittings; and threaded joints.
 3. Polypropylene pipe, "PP-R" or "PP-RCT" with socket, butt, or electro-fusion joints and fittings.
 4. PEX-a (Engle-method Crosslinked Polyethylene) piping with cold expansion or compression fittings.
- B. Hot-water heating piping and glycol piping, aboveground, NPS 2-1/2 and larger, shall be one of the following:

1. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.
 2. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered or pressure-seal joints.
 3. Schedule 40 steel pipe; Class 150, malleable-iron fittings; cast-iron flanges and flange fittings; and threaded joints.
 4. Polypropylene pipe, "PP-R" or "PP-RCT" with socket, butt, or electro-fusion joints and fittings.
 5. PEX-a (Engle-method Crosslinked Polyethylene) piping with cold expansion or compression fittings.
- C. Hot-water heating piping and glycol piping, belowground, NPS 2-1/2 and larger, shall be the following:
1. Pre-insulated PEX Thermal Distribution System: PEX-a service tubing with insulation and HDPE jacket with cold expansion or compression fittings.
- D. Air-Vent Piping:
1. Inlet: Same as service where installed.
 2. Outlet: Type K, annealed-temper copper tubing with soldered or flared joints.
- E. Safety-Valve-Inlet and -Outlet Piping for Hot-Water Piping: Same materials and joining methods as for piping specified for the service in which safety valve is installed.

3.2 VALVE APPLICATIONS

- A. Install shutoff-duty valves at each branch connection to supply mains, and at supply connection to each piece of equipment.
- B. Install check valves at each pump discharge and elsewhere as required to control flow direction.
- C. Install safety valves at hot-water generators and elsewhere as required by ASME Boiler and Pressure Vessel Code. Install drip-pan elbow on safety-valve outlet and pipe without valves to the outdoors; and pipe drain to nearest floor drain or as indicated on Drawings. Comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, for installation requirements.

3.3 PIPING INSTALLATIONS

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicate piping locations and arrangements if such were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- B. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes and free of sags and bends.
- G. Install fittings for changes in direction and branch connections.
- H. Install piping to allow application of insulation.
- I. Select system components with pressure rating equal to or greater than system operating pressure.
- J. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
- K. Install drains, consisting of a tee fitting, NPS 3/4ball valve, and short NPS 3/4threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.
- L. Reduce pipe sizes using eccentric reducer fitting installed with level side up.
- M. Install branch connections to mains with the branch connected to the bottom of the main pipe for down-feed risers and connect the branch to the top of the main pipe for up-feed risers.
- N. Install unions in piping, NPS 2and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.
- O. Install flanges in piping, NPS 2-1/2and larger, at final connections of equipment and elsewhere as indicated.
- P. Fire stopping shall be provided to both be compatible with the piping and meet the requirements of ASTM E 814 or ULC S115, "Fire Tests of Through-Penetration Firestops." Pipe insulations or fire resistive coating shall be removed where the pipe passes through a fire stop and, if required by the firestop manufacturer, for 3 inches beyond the firestop outside of the fire barrier.
- Q. Below-grade Installation:
 - 1. Pre-insulated piping shall be installed in accordance with manufacturer's recommendations and the details as shown on the contract drawings.
 - 2. The system will be installed with the fewest number of underground joints as possible.
 - 3. The system does not require expansion loops, expansion joints or compensators of any type.
 - 4. An EPDM rubber end cap shall be applied at all terminations of the piping system, including all fitting locations, to form a watertight seal.
 - 5. All buried fittings will be installed, insulated and sealed in accordance with the piping manufacturer's instructions.
 - 6. Connection Vaults or Insulation Kits are required for all below-grade installations.

- R. Backfill:
1. The pre-insulated piping system will be backfilled with clean sand material.
 2. Minimum vertical distance from the bottom of the tubing to the trench floor is 4 inches (100 mm).
 3. Minimum lateral distance from the side of the tubing to the trench wall is 6 inches (150 mm).
 4. Install a minimum of 12 inches (300 mm) of clean fill over the top of the potable pre-insulated piping.
 5. The balance of the trench can be backfilled with native soil void of stone greater than 2 inches (50mm) in diameter.

- S. PEX-a Piping:
1. PEX-a Piping Hanger Spacing: Install hangers for PEX-a piping with the following maximum spacing:
 - a. 1 inch and below: Maximum span, 32 inches.
 - b. 1-1/2 inch and above: Maximum span, 48 inches.
 2. PEX-a Piping Hanger Spacing with PEX-a Support Channel: Install hangers for PEX-a piping with horizontal support channel in accordance with local jurisdiction and manufacturer's recommendations, with the following maximum spacing:
 - a. Maximum span, 8 feet.
 3. PEX-a Riser Supports: Install CTS riser clamps at the base of each floor and at the top of every other floor. Install mid-story guides between each floor.
 4. Pipe Joint Connections: Install per manufacturer's recommendations. Use manufacturer-recommended cold-expansion tool for F1960 connections.

T. FIELD QUALITY CONTROL

- U. Site Tests: To ensure system integrity, pressure-test the tubing before and during backfilling of the piping. The service tubing will be air tested at 1 1/2 times the operating pressure for a minimum of 1 hour prior to system burial

V.

3.4 HANGERS AND SUPPORTS

- A. Hanger, support, and anchor devices are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment." Comply with the following requirements for maximum spacing of supports.
- B. Seismic restraints are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."
- C. Install the following pipe attachments:
1. Adjustable steel clevis hangers or adjustable band hangers for individual horizontal piping less than 20 feetlong.
 2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feetor longer.
 3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feetor longer, supported on a trapeze.

4. Spring hangers to support vertical runs.
 5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
 6. On plastic pipe, install pads or cushions on bearing surfaces to prevent hanger from scratching pipe.
- D. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:
1. NPS 3/4: Maximum span, 7 feet; minimum rod size, 1/4 inch.
 2. NPS 1: Maximum span, 7 feet; minimum rod size, 1/4 inch.
 3. NPS 1-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch.
 4. NPS 2: Maximum span, 10 feet; minimum rod size, 3/8 inch.
 5. NPS 2-1/2: Maximum span, 11 feet; minimum rod size, 3/8 inch.
 6. NPS 3: Maximum span, 12 feet; minimum rod size, 3/8 inch.
- E. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:
1. NPS 3/4: Maximum span, 5 feet; minimum rod size, 1/4 inch.
 2. NPS 1: Maximum span, 6 feet; minimum rod size, 1/4 inch.
 3. NPS 1-1/2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
 4. NPS 2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
 5. NPS 2-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch.
 6. NPS 3: Maximum span, 10 feet; minimum rod size, 3/8 inch.
- F. Plastic Piping Hanger Spacing: Space hangers according to pipe manufacturer's written instructions for service conditions. Avoid point loading. Space and install hangers with the fewest practical rigid anchor points.
- G. Support vertical runs at roof, at each floor, and at 10 footintervals between floors.

3.5 PIPE JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- F. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- G. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- H. Pressure-Sealed Joints: Use manufacturer-recommended tool and procedure. Leave insertion marks on pipe after assembly. A factory trained field representative shall provide on-site training for the Contractor's field personnel engaged in the operation and installation of pressure-sealed-joints. Upon completion of this training the installing Contractor must submit documentation, which includes those in attendance, from the grooved products manufacturer to CTA. The factory trained representative shall periodically visit the jobsite, review the product installation and provide additional training if new manpower has been assigned to pressure-sealed-joint piping installation. Contractor shall remove and replace any improperly installed products.

3.6 HYDRONIC SPECIALTIES INSTALLATION

- A. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.
- B. Install automatic air vents at high points of system piping in mechanical equipment rooms only. Manual vents at heat-transfer coils and elsewhere as required for air venting.
- C. Install in-line air separators in pump suction. Install drain valve on air separators NPS 2 and larger.
- D. Install bypass chemical feeders in each hydronic system where indicated, in upright position with top of funnel not more than 48 inches above the floor. Install feeder in minimum NPS 3/4 bypass line, from main with full-size, full-port, ball valve in the main between bypass connections. Install NPS 3/4 pipe from chemical feeder drain, to nearest equipment drain and include a full-size, full-port, ball valve.
- E. Install expansion tanks on the floor. Vent and purge air from hydronic system, and ensure tank is properly charged with air to suit system Project requirements.

3.7 CHEMICAL TREATMENT

- A. Utilize a water-treatment specialist with a minimum of 5 years of experience in water chemical treatment to perform an analysis of makeup water to determine type and quantities of chemical treatment needed to keep system free of scale, corrosion, and fouling, and to sustain the following water characteristics:
1. pH: 9.0 to 10.5.

2. "P" Alkalinity: 100 to 500 ppm.
 3. Boron: 100 to 200 ppm.
 4. Chemical Oxygen Demand: Maximum 100 ppm. Modify this value if closed system contains glycol.
 5. Corrosion Inhibitor as recommended by the chemical treatment supplier.
- B. Fill system with fresh water and add liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products from piping. Circulate solution for a minimum of 24 hours, drain, clean strainer screens, and refill with fresh water.
- C. Add initial chemical treatment and maintain water quality in ranges noted above for the first year of operation.
- D. Fill systems indicated to have antifreeze or glycol solutions to provide burst or freeze protection to following outdoor air temperatures.
1. Hot-Water Heating Piping: Freeze protection to -30 deg F.
- E. Freeze/burst protected piping systems filled with required percentage of glycol shall be mixed with distilled or deionized water as recommended by the approved glycol manufacturer.

3.8 FIELD QUALITY CONTROL

- A. Prepare hydronic piping according to ASME B31.9 and as follows:
1. Leave joints, including welds, uninsulated and exposed for examination during test.
 2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
 3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
 4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
 5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.
- B. Perform the following tests on hydronic piping:
1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
 2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
 3. Isolate expansion tanks and determine that hydronic system is full of water.
 4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times "SE" value in Appendix A in ASME B31.9, "Building Services Piping."

5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
 6. Prepare type-written report of testing. Include report in O&M manuals.
- C. Perform the following before operating the system:
1. Open manual valves fully.
 2. Inspect pumps for proper rotation.
 3. Set makeup pressure-reducing valves for required system pressure.
 4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
 5. Set temperature controls so all coils are calling for full flow.
 6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
 7. Verify lubrication of motors and bearings.

END OF SECTION 232113

SECTION 232123 - HYDRONIC PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Compact in-line circulators.
 - 2. Close-coupled, in-line centrifugal pumps.

1.3 SUBMITTALS

- A. Product Data: Include certified performance curves and rated capacities, operating characteristics, furnished specialties, final impeller dimensions, and accessories for each type of product indicated. Indicate pump's operating point on curves.
- B. Shop Drawings: Show pump layout and connections. Include setting drawings with templates for installing foundation and anchor bolts and other anchorages.
 - 1. Wiring Diagrams: Power, signal, and control wiring.
- C. Operation and Maintenance Data: For pumps to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain hydronic pumps through one source from a single manufacturer.
- B. Product Options: Drawings indicate size, profiles, and dimensional requirements of hydronic pumps and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. UL Compliance: Comply with UL 778 for motor-operated water pumps.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 COMPACT IN-LINE CIRCULATORS

- A. Manufacturers:
1. Armstrong Pumps Inc.
 2. Bell & Gossett; Div. of ITT Industries.
 3. Grundfos Pumps.
 4. Taco, Inc.
 5. Wilo USA LLC.
- B. Description: Water cooled, horizontal, in-line, compact design, seal-less, centrifugal, and single stage. Include pump and motor assembled on a common shaft in hermetically sealed unit, without stuffing boxes or mechanical seals. Include lubrication of sleeve bearing and cooling of motor by circulating pumped liquid through motor section, and isolation of motor section from motor-stator windings by corrosion-resistant, nonmagnetic, alloy liner. Include design rated for 125 psig minimum working pressure and a continuous water temperature of 225 deg F.
1. Casing: Cast bronze or cast iron, with stainless-steel liner, static o-ring seal to separate motor section from motor stator, and flanged piping connections.
 2. Impeller: Overhung, single suction, closed or open, nonmetallic.
 3. Shaft and Sleeve: Stainless-steel shaft with carbon-steel sleeve.
 4. Motor: Single speed.
 5. Motor: Variable speed for use with load match hydronic systems.

2.3 CLOSE-COUPLED, IN-LINE CENTRIFUGAL PUMPS

- A. Manufacturers:
1. Armstrong Pumps Inc.
 2. Aurora Pump; Division of Pentair Pump Group.
 3. Bell & Gossett; Div. of ITT Industries.
 4. Grundfos Pumps.
 5. PACO Pumps.
 6. Taco, Inc.
- B. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, close-coupled, in-line pump as defined in HI 1.1-1.2 and HI 1.3; designed for installation with pump and motor shafts mounted horizontally or vertically. Rate pump for 175-psig minimum working pressure and a continuous water temperature of 250 deg F.

- C. Pump Construction:
 - 1. Casing: Radially split, cast iron, with, threaded gage tappings at inlet and outlet, and threaded companion-flange connections.
 - 2. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw. Trim impeller to match specified performance.
 - 3. Pump Shaft: Steel, with copper-alloy shaft sleeve.
 - 4. Mechanical Seal: Carbon rotating ring against a ceramic seat held by a stainless-steel spring, and EPT bellows and gasket. Include water slinger on shaft between motor and seal.
 - 5. Pump Bearings: Permanently lubricated ball bearings.

- D. Motor: Single speed, with permanently lubricated ball bearings, unless otherwise indicated; and rigidly mounted to pump casing. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for piping systems to verify actual locations of piping connections before pump installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PUMP INSTALLATION

- A. Comply with HI 1.4.
- B. Install pumps with access for periodic maintenance including removal of motors, impellers, couplings, and accessories.
- C. Independently support pumps and piping so weight of piping is not supported by pumps and weight of pumps is not supported by piping.

3.3 CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to machine to allow service and maintenance.
- C. Connect piping to pumps. Install valves that are same size as piping connected to pumps.
- D. Install suction and discharge pipe sizes equal to or greater than diameter of pump nozzles.
- E. Install pressure gages on pump suction and discharge, at integral pressure-gage tapping, or install single gage with multiple input selector valve.

- F. Install electrical connections for power, controls, and devices.
- G. Ground equipment according to Division 26.
- H. Connect wiring according to Division 26.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain hydronic pumps. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 232123

SECTION 235100 - BREECHINGS, CHIMNEYS, AND STACKS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Listed double-wall vents.

1.2 SUBMITTALS

A. Product Data: Manufacturers literature with material gages, product listing and furnished accessories.

B. Shop Drawings: For vents, breechings, chimneys, and stacks. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, methods of field assembly, components, hangers and seismic restraints, and location and size of each field connection.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain listed system components through one source from a single manufacturer.

B. Certified Sizing Calculations: Manufacturer shall certify venting system sizing calculations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 Articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cleaver-Brooks; Div. of Aqua-Chem Inc.
 - b. Hart & Cooley, Inc.
 - c. Heat-Fab, Inc.
 - d. Metal-Fab, Inc.
 - e. Schebler Co. (The).
 - f. Selkirk Inc.; Selkirk Metalbestos and Air Mate.
 - g. Simpson Dura-Vent Co., Inc.; Subsidiary of Simpson Manufacturing Co.

2.2 LISTED TYPE B AND BW VENTS

- A. Description: Double-wall metal vents tested according to UL 441 and rated for 480 deg F continuously for Type B, or 550 deg F continuously for Type BW; with neutral or negative flue pressure complying with NFPA 211.
- B. Construction: Inner shell and outer jacket separated by at least a 1/4-inch airspace.
- C. Inner Shell: Aluminum alloy or stainless steel.
- D. Outer Jacket: Galvanized or aluminized steel.
- E. Accessories: Tees, elbows, increasers, draft-hood connectors, terminations, adjustable roof flashings, storm collars, support assemblies, thimbles, firestop spacers, and fasteners; fabricated from similar materials and designs as vent-pipe straight sections; all listed for same assembly.
 - 1. Termination: Round chimney top designed to exclude minimum 98 percent of rainfall.
 - 2. Termination: Antibackdraft.

2.3 LISTED BUILDING-HEATING-APPLIANCE CHIMNEYS

- A. Description: Double-wall metal vents tested according to UL 103 and rated for 1000 deg F continuously, or 1700 deg F for 10 minutes; with neutral or negative flue pressure complying with NFPA 211.
- B. Construction: Inner shell and outer jacket separated by at least a 1 inch annular space filled with high-temperature, ceramic-fiber insulation.
- C. Inner Shell: ASTM A 666, Type 304 stainless steel.
- D. Inner Shell: ASTM A 666, Type 304 stainless steel.
- E. Outer Jacket: Galvanized or aluminized steel.
- F. Accessories: Tees, elbows, increasers, draft-hood connectors, terminations, adjustable roof flashings, storm collars, support assemblies, thimbles, firestop spacers, and fasteners; fabricated from similar materials and designs as vent-pipe straight sections; all listed for same assembly.
 - 1. Termination: Round chimney top designed to exclude 98 percent of rainfall.

2.4 GUYING AND BRACING MATERIALS

- A. Cable: Three galvanized, stranded wires of a size determined by the manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION OF LISTED VENTS AND CHIMNEYS

- A. Locate to comply with minimum clearances from combustibles and minimum termination heights according to product listing or NFPA 211, whichever is most stringent.
- B. Support vents at intervals recommended by manufacturer to support weight of vents and all accessories, without exceeding appliance loading.

3.2 CLEANING

- A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes.
- B. Provide temporary closures at ends of breechings, chimneys, and stacks that are not completed or connected to equipment.

END OF SECTION 235100

SECTION 235250 – WOOD BOILER SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes packaged, factory-fabricated and assembled boilers, trim, and accessories for generating hot water from burning wood chips. Boiler includes heat exchanger and burner tube.
- B. This Section includes factory-fabricated walking floor scraper system, collection augers, lift auger, metering bin and stocker auger.

1.2 SUBMITTALS

- A. Shop Drawings: For boilers, boiler trim, accessories, and vacuum hose. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Wiring Diagrams: Power, signal, and control wiring.
- B. Field quality control test reports.
- C. Operation and maintenance data: For boilers, components, and accessories to include in emergency, operation, and installation manuals.
- D. Post-Installation Checklist and Operating Training Form.
- E. Warranty: Special warranty specified in this Section.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain boiler and associated wood fuel handling equipment through one source from a single supplier.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. UL Compliance: Provide UL listed electrical components.

1.4 WARRANTY

- A. Manufacturer's standard form in which manufacturer agrees to repair or replace controls, burner or heat exchanger of boilers that fail in materials or workmanship within the specified warranty period.
 - 1. Burner parts 10 years from date of startup by factory-authorized personnel. Normal wear parts are excluded.

2. Heat exchanger 5 years from date of startup by factory-authorized personnel.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Twin Heat by Biomass Systems Supply, Chico, CA

2.2 BOILER

- A. Description: Factory-fabricated, assembled, and tested, steel flame-tube boilers with heat exchanger sealed pressure tight, built on a steel base plate; including insulated jacket, flue-gas vent, water supply and return connections, and controls.
- B. Heat Exchanger Design: Straight, steel tubes welded into round steel vessel. Two passes with wet-leg design. Minimum heat-exchanger surface of 58.7 sq. ft. Including the following accessories:
 1. Accessible drain and blowdown tappings, both high and low, for surface and mud removal.
 2. Tappings for supply and return water piping.
- C. Combustion Chamber: steel, with stainless steel secondary air ports for dual stage combustion.
- D. Top and Front Doors:
 1. Top door, sealed with heat resistant gaskets and fastened with lugs and wing-nuts.
 2. Front hinged door, sealed with heat resistant gaskets and secured with hardened handle.
 3. Designed so tubes, combustion chamber and burner re fully accessible for inspection or cleaning when doors are open.
 4. Front door allow for inspection of flame conditions.
 5. Door refractory and insulation shall be accessible for inspection and maintenance.
- E. Casing:
 1. Insulation: Minimum 2-inch thick, fiberglass insulation surrounding the boiler shell.
 2. Flue Connection: 7-inch flange at back of boiler.
 3. Jacket: Sheet metal, with screw and clip fastened closures and powder coated protective finish.
- F. Barometric damping required.

2.3 BURNER

- A. Burner: Welded steel construction, with primary air plate ports and bottom screw conveyor feed for wood chip fuel. Mounted to boiler side, fastened with lugs and nuts.
- B. Combustion Blower: Variable speed centrifugal fan integral to burner, directly driven by motor, with fixed primary, secondary air ratio plenum.

- C. Fuel Supply: Direct mounted gear motor and auger, with modulated, on-off control sequence. Fed through air-tight fire valve.
- D. Flue Gas Fan: Variable speed centrifugal fan integral to smoke box, directly driven motor, controlled via PID, using feedback from manometer.
- E. Water cooled burner tube pump, pressure switch, and accessories.
- F. Emergency burner tube cooling back up connection with connection to domestic water.

2.4 ASH HANDLER

- A. Flame Tube Cleaning Mechanism: Cam driven cleaning mechanism provides vertical oscillation of stainless steel spiral turbulators, twice daily.
- B. Burner Plate Cleaning Mechanism: Steel burner scraper plate oscillated with steel rod eccentrically driven with dedicated motor, ash removal system controlled.
- C. Ash Screw-Conveyor:
 - 1. Screw-conveyor and hardened steel ash wiper direct drive with shaded pole motor.
 - 2. Shaft rotation monitor invokes boiler shutdown when ash box full, after showing requirement to empty for 6 burner hours.
 - 3. Controlled by ash removal system logic.
- D. Ash Box: Detachable external compressed ash storage, fed by screw conveyor through ball valve.

2.5 CONTROLS

- A. Operating controls shall include the following devices and features:
 - 1. Electric factory-installed panel to control burner firing rate to maintain boiler set temperature.
 - 2. Low-Water Cutoff: Electronic probe shall prevent burner operation on low water. Cutoff switch shall be manual reset type.
- B. System Interface: Factory-install hardware and software to enable system monitor, control and display boiler status and faults.

2.6 TRIM

- A. RTD Controllers.
- B. Pressure and Temperature Gage.
- C. Drain Valve: 1/2-inch diameter.
- D. Blowdown Plugs: Factory-installed bottom and surface, blowdown plugs 1-1/4-inch.
- E. 100 Liter open expansion tank.

- F. Stoker sprinkler head for burn back prevention.

2.7 ELECTRICAL POWER

- A. Field Power Available to boiler: 208 VAC, 3 Phase, 16 Amps.
 - 1. If other voltage is needed, boiler manufacturer shall provide transformer to supply boiler and boiler components the voltage needed.

2.8 WOOD HANDLING EQUIPMENT

- A. Hydraulic walking floor scraper system. Components shall be heavy duty to accommodate 15 feet of wood chips on top.
- B. Collection Auger. To lift wood chips to metering bin.
- C. Air-tight spring loaded valve between burner and day bin for burnback fire prevention controlled by boiler to automatically close before vacuum fills day bin or during power loss.
- D. Field Power Available to wood handling system: 208 VAC, 3 Phase, 16 Amps.
 - 1. If other voltage is needed, boiler manufacturer shall provide transformer to supply fuel handling equipment and components the voltage needed.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Before boiler installation examine locations, and piping and electrical connections to verify actual locations, sizes, and other conditions affecting boiler performance, maintenance, and operations.
- B. Determine exact locations before roughing-in for piping and electrical connections.
- C. Install boilers on a flat level base on a non-combustible floor or shielding. The floor must comply with NFPA 31.
- D. Examine mechanical spaces for suitable conditions where boilers will be installed.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.
- F. Before wood fuel handling delivery system installation, examine boiler and storage location to verify actual lengths, locations, and orientations affecting connection of the wood chip delivery system.

3.2 BOILER INSTALLATION

- A. Consult all provided installation manuals and factory training programs prior to installation.
- B. Install boilers according to NFPA 31.
- C. Assemble and install boiler trim.
- D. Install electrical devices furnished with the boiler but not specified to be factory mounted.

3.3 WOOD CHIP DELIVERY SYSTEM INSTALLATION AND ASSEMBLY

- A. Consult all installation manuals and factory training prior to install.

3.4 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Allow for removable boiler casing do not attach non-removable connections to the sheet metal boiler jacket.
- C. Install piping adjacent to boiler to allow service and maintenance.
- D. Connect wood chip delivery system to burner.
- E. Connect hot-water piping to supply and return boiler tappings with shutoff valve and union and flange at each connection.
- F. Connect boiler flue gas to chimney.
- G. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- H. Install piping adjacent to machine to allow service and maintenance.
- I. Ground equipment according to Division 26.
- J. Connect wiring according to Division 26.

3.2 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Perform installation and startup checks according to manufacturer's written instructions.
 - 2. Leak Test: Hydrostatic test. Repair leaks and retest until no leaks exist.
 - 3. Perform the heating system checklist supplied in the installation manual.
 - 4. Operational Test: Start units to confirm proper unit operation.
 - 5. Test and adjust controls and safeties, perform safety and operating controls checklist supplied in the installation manual.

6. Replace damaged and malfunctioning controls and equipment.
 - a. Check and adjust initial operating set points and high and low limit safety set points of water level and water temperature.
 - b. Make field adjustments as indicated.
7. Remove and replace malfunctioning units and retest as specified above.

B. Boilers shall comply with requirements indicated, as determined by field output test.

C. Adjust, modify, or replace equipment in order to comply.

D. Document test results in a report and submit to Architect.

3.3 DEMONSTRATION

- A. Engage a factory authorized installer to train Owner's maintenance personnel to adjust, operate, and maintain boilers and vacuum delivery system.

END OF SECTION 235250

SECTION 235700 - HEAT EXCHANGERS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes plate heat exchangers.

1.3 SUBMITTALS

- A. Product Data: Include rated capacities, pressure drops, weights, furnished specialties, accessories, and installation instructions.
- B. Operation and Maintenance Data: For heat exchangers to include in operation and maintenance manuals.

1.4 QUALITY ASSURANCE

- A. ASME Compliance: Fabricate and label heat exchangers to comply with ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," Division 1.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 BRAZED PLATE HEAT EXCHANGERS

- A. Manufacturers:
 - 1. Alfa Laval Thermal, Inc.
 - 2. Armstrong Pumps, Inc.

3. ITT Industries; Bell & Gossett.
 4. Kelvin, GEA.
 5. Taco, Inc.
-
- B. Configuration: Brazed assembly consisting of two end plates, one with threaded nozzles and pattern-embossed plates.
 - C. End-Plate Material: Type 316 stainless steel.
 - D. Threaded Nozzles: Type 316 stainless steel.
 - E. Plate Material: Type 316 stainless steel.
 - F. Brazing Material: Copper or nickel.

PART 3 - EXECUTION

3.1 HEAT-EXCHANGER INSTALLATION

- A. Install heat exchangers according to manufacturer's written instructions.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other related Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Maintain manufacturer's recommended clearances for service and maintenance. Install piping connections to allow service and maintenance of heat exchangers.
- C. Install shutoff valves at heat-exchanger inlet and outlet connections.

3.3 CLEANING

- A. After completing system installation, including outlet fitting and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes.

END OF SECTION 235700

SECTION 238239.16 – PROPELLER UNIT HEATERS

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 propeller unit heaters with hot-water coils.

1.3 DEFINITIONS

- A. CWP: Cold working pressure.

1.4 SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated capacities, operating characteristics, furnished specialties, and accessories.
- B. Shop Drawings:
 - 1. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Include details of anchorages and attachments to structure and to supported equipment.
 - 3. Wiring Diagrams: Power, signal, and control wiring.
- C. Operation and Maintenance Data: For propeller unit heaters to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Airtherm; a Mestek company.
 - 2. CCI Thermal Technologies, Inc.

3. Engineered Air.
4. Rosemex Products.
5. Trane.
6. Reznor.

2.2 DESCRIPTION

- A. Assembly including casing, coil, fan, and motor in horizontal discharge configuration with adjustable discharge louvers.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with UL 2021.
- D. Comply with UL 823.

2.3 HOUSINGS

- A. Finish: Manufacturer's standard baked enamel applied to factory-assembled and -tested propeller unit heaters before shipping.
- B. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

2.4 COILS

- A. General Coil Requirements: Test and rate hot-water propeller unit-heater coils according to ASHRAE 33.
- B. Hot-Water Coil: Copper tube, minimum 0.025-inch wall thickness, with mechanically bonded aluminum fins spaced no closer than 0.1 inch and rated for a minimum working pressure of 200 psig and a maximum entering-water temperature of 325 deg F, with manual air vent. Test for leaks to 350 psig underwater.
- C. Hot-Water Coil: Steel tube, minimum 0.049-inch wall thickness, with mechanically bonded aluminum fins spaced no closer than 0.1 inch and rated for a minimum working pressure of 400 psig and a maximum entering-water temperature of 450 deg F, with manual air vent. Test for leaks to 600 psig underwater.

2.5 FAN AND MOTOR

- A. Fan: Propeller type with aluminum wheel directly mounted on motor shaft in the fan venturi.
- B. Motor: Permanently lubricated, multispeed or 2-speed. Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive propeller unit heaters for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for piping and electrical connections to verify actual locations before unit-heater installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install propeller unit heaters to comply with NFPA 90A.
- B. Install propeller unit heaters level and plumb.
- C. Suspend propeller unit heaters from structure with all-thread hanger rods and elastomeric spring hangers. Hanger rods and attachments to structure are specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment." Vibration hangers are specified in Section 230548 "Vibration and Seismic Controls for HVAC."

3.3 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to machine to allow service and maintenance.
- C. Connect piping to propeller unit heater's factory, hot-water piping package. Install the piping package if shipped loose.
- D. Comply with safety requirements in UL 1995.
- E. Ground equipment according to Division 26.
- F. Connect wiring according to Division 26.

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 2. Operate electric heating elements through each stage to verify proper operation and electrical connections.
 - 3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

- B. Units will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain propeller unit heaters.

END OF SECTION 238239.16

DIVISION 26 - ELECTRICAL

SCOPE

The provisions, terms and requirements of Division 1 and 2, the applicable Drawings and Technical Specifications herein shall apply to work under this Division.

This Work consists of, but is not necessarily limited to, the furnishing of all labor, equipment, appliances and materials and the performance of all operations in connection with the installation of all electrical work completed, in strict accordance with Specifications and/or Drawings, applicable codes, including incidental materials necessary and required for their completion.

"PROVIDE" = Furnished and installed complete. "OR EQUAL" = Or equal as approved to quote by Engineer, 10 days prior to Bid.

260000 - COMMON WORK RESULTS

- A. Intent of Drawings: Drawings are partly diagrammatic and do not show exact location of conduit unless specifically dimensioned.
- B. Workmanship:
 - 1. Work shall be accomplished by workmen skilled in particular trade, in conformance with best practices and accepted standards.
 - 2. Work shall contribute to efficiency of operation, accessibility, maintenance and appearance. No part of installation shall interfere with operation of any other system or part of building.
 - 3. Non-satisfactory work shall be corrected at no additional expense to Owner.
- C. Responsibility:
 - 1. The Electrical Contractor is responsible for installation of satisfactory and complete work in accordance with the intent of Drawings and Specifications. Provide, at no extra cost, incidental items required for completion of work even though not specifically mentioned or indicated in Specifications or on Drawings.
 - 2. If, at any time, and in any case, change in location of conduit, outlets, fixtures, switches, panels, electrical equipment or associated components, etc., becomes necessary due to obstacles or installation of other trades, such required changes shall be made by Contractor at no extra cost.
 - 3. Conflicts discovered during construction shall be immediately called to the attention of the Engineer for decision. Do not proceed with installation in area of question until conflict has been fully resolved.
 - 4. Coordinate all electrical work with other trades to prevent unnecessary delays in the construction schedule.
 - 5. Excavation and backfill required by electrical installations shall be accomplished in accordance with Division 2 by this Contractor.
 - 6. Provide temporary electrical power and lighting for all trades that require service during the course of this Project. Provide temporary service and distribution as required. Comply with the NFPA 70 and OSHA requirements. (Energy costs by General Contractor.)

- D. Guarantee-Warranty: This Contractor shall and hereby does warrant and guarantee:
1. That all work executed under this Section will be free from defects of materials and workmanship for a period of one year from the date of final acceptance of this work.
 2. The Contractor agrees to, at the Contractor's own expense, repair and replace all such defective materials and work and all other work damaged thereby which becomes defective during the term of warranty. Agreement does not include damages done by Owner.
- E. Permits, Tests, Codes and Standards:
1. Electrical Contractor to pay for all permits and fees in connection with this work.
 2. WORK SHALL BE IN ACCORDANCE WITH THE MOST RECENT EDITIONS OF ADOPTED LOCAL, STATE AND NATIONAL CODES AND ORDINANCES, THE STATE FIRE MARSHAL, AND UTILITY COMPANY REGULATIONS.
 3. Electrical work shall conform to National Electrical Codes, latest editions, as a minimum requirement.
 4. All material to conform with applicable standards.
- F. Discrepancies: Prior to submitting Bid, Contractor shall refer any apparent discrepancies or omissions to engineer for clarification.
- G. Prior Approvals: All proposed substitutions shall be received by the Engineer **10 days prior to Bid. Priors received after 3 p.m. of the 10th day will be rejected.** Supply technical data, photometrics and dimensional Drawings showing that substitutes are equal to product specified.
- H. Shop Drawing Submittals:
1. In addition to distribution requirements for submittals specified in Division 1 Section "Submittals," submit Electronic Drawings in pdf format for final and official approval through the General Contractor as listed below.
- Additional copies may be required by individual Sections of these Specifications. Copies of price list sheets are not acceptable. Manufacturer's name and address must appear on each sheet. All copies shall be legible.
- Shop Drawings shall include a completed specification sheet of all equipment along with fabrication, installation drawings, setting diagrams, schedules, patterns, templates and similar Drawings.
- I. Project Close-Out Record Documents:
1. Provide three full size sets, unless more are called for under Division 1 (one for Engineer and one for Owner). In addition to requirements called for under Division 1, indicate the following installed conditions:
 - a. Actual location of all electrical service gear/feeders, panel/motor/special equipment feeders, all major underground or underslab conduits, all conduit stubs for future use, any change in branch circuitry from Drawings, key junction boxes and pull boxes not indicated on Drawings, any control locations or indicator lights not shown on Drawings.

- b. Addendum items, change order items and all changes made to Drawings from Bidding phase through to Project completion.
- c. Actual equipment and materials installed. Where manufacturer and catalog number are indicated on Drawings, generally or in fixture or equipment schedules, change to reflect actual products installed.
- d. Change service panel and branch panel breaker locations and schedules to reflect actual installed conditions.

J. Project Close-out Maintenance Manuals:

- 1. Prepare 3 copies, unless more are called for under Division 1 (one for Engineer, two for Owner). In addition to requirements under Division 1, provide heavy duty, durable 3-ring vinyl covered loose-leaf binder for each manual sized to receive 8.5 inch by 11 inch paper. Provide a clear plastic sleeve on the spine to hold labels and pockets in the cover to receive folded sheets. In manual, include all Shop Drawings, installation/operation/maintenance data furnished with electrical equipment, voice/data test reports, and letters from manufacturer's representatives that the fire alarm, has been completed and tested to satisfy requirements/codes. List project name, date, and Contractor's name, address and telephone number. Include index sheet for each Specification Section indicating equipment, with supplier and supplier's telephone number. Provide tabbed dividers indicating major groupings of equipment.
- 2. Turn over to Owner all spare equipment and devices specified and shown.

K. Supporting Equipment:

- 1. Unless otherwise indicated, fasten electrical items and their supporting hardware securely to the building structure, including conduits, raceways, cables, cable trays, busways, cabinets, panelboards, transformers, boxes, disconnect switches, and control components. Fasten by means of wood screws or screw-type nails on wood, toggle bolts on hollow masonry units, concrete inserts or expansion bolts on concrete or solid masonry, and machine screws, welded threaded studs, or spring-tension clamps on steel. Threaded studs driven by a power charge and provided with lock washers and nuts may be used instead of expansion bolts and machine or wood screws. Do not weld conduit, pipe straps, or items other than threaded studs to steel structures. In partitions of light steel construction, use sheet metal screws. All device boxes in sheetrock walls will be tight before, during and after installation of sheetrock.
- 2. Provide supports for electrical items in accordance with NFPA 70 and all other applicable codes.
- 3. Contractor responsible for providing watertight conduit penetrations at all watertight walls, floors roofs and membranes. Contractor also responsible to maintain fire rating of walls, floors, roofs and membranes penetrated.
- 4. When applicable, center within insulation any electrical conduit routed in attic space. Provide sealing as per NFPA 70 300-7 for all conduits exposed to different temperatures.

L. Electrical Identification:

- 1. Apply circuit/control/item designation labels of engraved plastic laminate for disconnect switches, breakers, pushbuttons, pilot lights, motor starters, panelboards and main control panel and similar systems.
- 2. Identify all 120 VAC and 208 VAC power receptacle cover plates with panel and circuit number utilizing a clear label with black designations. Designation example: L1-38.

3. Identify underground exterior electrical circuits by installation of continuous underground plastic marker, 6 - 8 inches below grade.

260300 - REMODEL WORK

- A. The Contractor shall carefully examine the Drawings and Specifications, visit the project site, and make note of all existing conditions, dimensions and limitations prior to Bid and make allowances thereto.
- B. No Change Orders will be issued for Contractor's failure to visit site, remodel work necessary for a complete installation of systems shown, and due to Contractor's lack of understanding of amount or difficulty of work involved.
- C. The Contractor shall also notify all corporations, companies, individuals or local authorities owning, or having jurisdiction over existing utilities and services which interfere in any manner with the execution of the work under this Contract, and shall remove, relocate or protect such utilities or equipment as required by the parties having jurisdiction over same.
- D. If existing active or nonactive services (which may not be shown on plans) are encountered that require relocation or disconnecting, the Electrical Contractor shall make written request for decision on proper handling of the services. The Electrical Contractor shall not proceed with the work until so authorized by the Architect.
- E. When areas of the existing buildings are adjacent to the area of construction in which work is going on and are occupied, then this Contractor shall arrange the work so as to reduce to a minimum the periods of interruption or outages in the various services.
- F. Not less than one week before any system is to be put out of service, the Contractor shall notify and coordinate with other trades and the Owner of such necessity including the extent of the work to be done during the outage, possible length of time required for that phase of the work, and the desired time at which the outage is to begin.
- G. Balance additional loads to existing circuitry between phases. Furnish a revised, typed panel directory on existing panelboards where loads have been added or changed on this project.
- H. Carefully lay out all work in advance to minimize cutting, channeling or drilling. Where necessary, all cutting and patching shall be done in a manner approved by the Architect. Do not endanger the stability of the structure. Restore any damaged surfaces to original conditions. Contractor at fault to assume all costs.
- I. Remove or relocate existing conduits, wires, equipment, devices or fixtures indicated on Drawings and as required by remodel operations. Where the reuse of existing conduits, wires, devices, or fixture is permitted, verify that wiring is continuous. Existing outlets or junction boxes shall not be rendered inaccessible by structural changes made to the building.
- J. Where existing walls are being furred out or refinished, extend existing outlets and devices to new surface as required.

- K. Existing equipment which is indicated as being removed and not indicated for re-use shall be disposed of unless stated otherwise. Light fixture ballasts may contain PCB's and shall be disposed of according to environmental regulations.

260519 - CONDUCTORS AND CABLES

- A. Submit Shop Drawings in accordance with the "Common Work Results" Section.
- B. Feeders: Copper THHN-THWN. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- C. Branch Circuits: Copper THHN-THWN. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- D. Multiconductor Cable: Copper Type AC and Type MC with separate insulated ground wire.
- E. Aluminum conductors are not acceptable.
- F. Conductor Insulation: Comply with NEMA WC 70 for types THHN-THWN. Utilize other types of insulation only where specifically noted or required by code for the installed condition.
- G. Tighten electrical connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening valves or as specified in UL Codes.
- H. Color code secondary service, feeder, and branch circuit conductors with factory applied color as follows:

<u>208y/120 Volts</u>	<u>Phase</u>
Black	A
Red	B
Blue	C
White	Neutral
Green	Ground

260526 - GROUNDING AND BONDING

- A. Submit Shop Drawings in accordance with the "Common Work Results" Section.
- B. Install separate insulated equipment grounding conductors for feeder and branch circuits in compliance with NFPA 70 Article 250.
- C. additional grounding requirements and comply with NFPA 70 and all other applicable codes/standards.

260533 - RACEWAYS AND BOXES

- A. Submit Shop Drawings in accordance with the "Common Work Results" section.
- B. Conduit Raceway:

1. Indoors, use the following, unless otherwise stated:
 - a. Concealed: EMT or MC cable.
 - b. Exposed: EMT, IMC or RMC.
 - c. Connection to vibrating equipment: Flexible metal conduit.
 2. Outdoors, use the following, unless otherwise stated:
 - a. Concealed: RMC or IMC.
 - b. Exposed: RMC or IMC.
 - c. Underground: Schedule 40 PVC with Schedule 80 PVC fittings.
 - d. Connection to Vibrating Equipment: Liquid tight flexible metal conduit.
 3. **ENT IS NOT ALLOWED.**
 4. Conceal conduit and cable, unless otherwise noted; conduit is permitted to be exposed in equipment rooms. All conduits shall have insulated ground wire installed. Do not install conduit embedded in slabs. EMT fittings shall be steel, compression or set screw type. All raceways shall be installed and supported in accordance with NFPA 70 and applicable codes.
- C. Outlet Boxes:
1. Conform to UL 514A, "Metallic Boxes, Electrical," and UL 514B, "Fittings for Conduit and Outlet Boxes." Outlet boxes shall be metallic and installed flush in all areas, except mechanical rooms, above lay-in ceilings, or as otherwise indicated. Minimum size to be 4 inches square by 2-1/8 inches deep. Boxes shall be of type, shape, size and depth to suit each location and application. All fittings shall be steel.
- D. Pull and Junction Boxes:
1. Comply with UL 50, "Electrical Cabinets and Boxes," for boxes over 100 cubic inches volume. Boxes shall have screwed or bolt-on covers, shall be suitable for the intended application and shall be labeled.
- E. All materials shall be UL listed, appropriate for intended application. Entire raceway system shall be in accordance with NFPA 70, ANSI, NEMA, UL, and all other applicable codes.

262716 - SERVICE ENTRANCE

- A. Submit Shop Drawings in accordance with the "Common Work Results" Section.
- B. Install service-entrance equipment as indicated, in accordance with equipment manufacturer's written instructions, and with recognized industry practices, to ensure that service-entrance equipment fulfills requirements. Comply with applicable installation requirements of NFPA 70, UL, ANSI, IEEE, and NEMA standards.
- C. Tighten electrical connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standards 486A, and the NFPA 70.

262416 - PANELBOARDS

- A. Submit Shop Drawings in accordance with the "Common Work Results" Section.
- B. Manufacturer: Siemens, Square-D, GE or Cutler Hammer.
- C. Load centers are not acceptable unless specifically noted.
- D. Branch Panelboards shall have aluminum bus including neutral and ground bars. Breakers shall be bolt on type. All 3-pole breakers 50 amp and larger shall have minimum feature of a thermal magnetic adjustment. Features: Provide hinged front cover and hinged door (door in door) and feed through lugs. If indicated on the Panel Schedule, provide internal SPD with a 120 kA per phase surge rating and protect L-N, L-G and N-G modes; include status indicator.
- E. Distribution Panelboards shall have aluminum bus including neutral and ground bars. Breakers shall be bolt on type for 125A and smaller. Breakers larger than 125A shall be bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal. All 3-pole breakers 50 amp and larger shall have minimum feature of a thermal magnetic adjustment. Breakers with 1200 amp frame or larger shall be equipment with an Arc Flash Energy-reducing maintenance switching with local status indicator. Provide hinged front cover and hinged door (door in door). If indicated on the Panel Schedule, provide internal SPD with a 120 kA per phase surge rating and protect L-N, L-G and N-G modes; include status indicator.
- F. Provide typed circuit schedules for existing panelboards where loads have changed and framed, typed circuit schedules for all new panelboards with identification of items controlled by each individual breaker. Indicate room numbers of items controlled or room name where appropriate for Owner's convenience.

262726 - WIRING DEVICES

- A. Submit Shop Drawings in accordance with the "Common Work Results" Section.
- B. Acceptable Manufacturers: Pass & Seymore, Bryant, GE, Hubbell, Leviton.
- C. Devices:
 - 1. General light switches shall be 20 amp, 120/277 volt AC rated and **Industrial Grade**.
 - 2. General receptacles shall be self grounding 5-20R and **Industrial Grade**. GFCI receptacles shall be 20 amp feed through type with two utilization points. Do not connect downstream devices to load side of GFCI.
 - 3. General device color shall be **white**.
- D. Device Plates:
 - 1. Device plates shall have opening for device intended and shall be **Lexan**. General device color shall be **white**.
 - 2. All device plates shall have a clear label with the panel and circuit number designation in black.

3. Weatherproof receptacle covers shall be a corrosion resistant die cast metal, minimum 3 inch deep, flip cover with latch and with pad locking provisions.

262813 - OVER CURRENT PROTECTION DEVICES

- A. Submit Shop Drawings in accordance with the "Common Work Results" Section.
- B. Fuses:
 1. Motor or combination motor/branch circuit: UL listed RK-5.
 2. Feeder Loads: UL listed RK-1.
 3. Plug fuses shall be dual element Type S with adapter.
 4. Manufacturer: Bussman, Gould, Littlefuse or Brush.

262816 - CIRCUIT AND MOTOR DISCONNECTS

- A. Submit Shop Drawings in accordance with the "Common Work Results for Electrical" Section.
- B. Manufacturer: Same as panelboard manufacturer.
- C. Disconnects shall be heavy duty type with Class R rejection feature when required to be fusible. Voltage rating shall be at or greater than the application voltage. Provide NEMA 3R enclosure for exterior locations. Service switches shall be UL listed for use as service equipment.

262913 - MOTOR CONTROLLERS

- A. Submit Shop Drawings in accordance with the "Common Work Results" Section.
- B. Manufacturer: Same as panelboard manufacturer.
- C. Unless scheduled otherwise, 3/4 horsepower or less single-phase motors shall have 1 HP rated manual toggle starters with thermal overload protection sized for the motor in accordance with NFPA 70. Provide pilot light for manual starters not in sight from motor. Units located at the exterior of the building shall be NEMA 3R rated.
- D. Starters shall be across-the-line magnetic type, combination starter/disconnect, FVNR, and HP rated, unless otherwise scheduled. Starter shall have solid state adjustable and resetable overload protection on all phases, constructed of one-piece Class 20 construction. Provide 120 volt control, H-O-A and interlocks where indicated on schedules. Provide two N/O auxiliary contacts. Units located at the building exterior shall be NEMA 3R rated.
- E. All motor controllers shall be UL listed and installed in accordance with NFPA 70, NEMA, and manufacturer's recommendations.

265100 - LIGHTING

- A. Submit Shop Drawings in accordance with the "Common Work Results" Section.

- B. Manufacturer, model, style, color, size, etc., as scheduled. If no color has been selected, provide fixture with the standard finish as published by the manufacturer. All fixtures to be supplied as complete, housing, sockets, lamp holders, internal working, wire guards, lens guards, diffusing materials or lenses, pendants, hangers, canopies, aligners, end caps, ballasts and emergency battery packs, plaster frames, recessing boxes, hold down clips, anchor bolts, etc. Install plumb and true, free of light leaks, warps, dents and other irregularities.
- C. Support for Suspended Fixtures: Brace pendants and rods over 48 inches long to limit swinging. Support stem-mounted, single-unit, suspended fluorescent fixtures with twin-stem hangers. For continuous rows, use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of chassis, including one at each end.
- D. Surface-mounted light fixtures attached to a ceiling grid shall be attached with positive clamping devices that completely surround the supporting members. Safety wires shall be attached between the clamping device and the adjacent ceiling hanger or to the structure above.
- E. LED Modules:
 - 1. Comply with ANSI C78.377, UL 8750, IES LM-79 and IES LM-80.
 - 2. CRI minimum of 80 or as scheduled.
 - 3. Efficiency: 100 Lumens per watt minimum for downlights and 90 lumens minimum per watt minimum for other fixture types or as schedule on the drawings.
 - 4. Rated life of minimum 50,000 hours minimum or as scheduled.
 - 5. Fully serviceable and upgradable Light Engine.
 - 6. Warranty: 3-year minimum for all fixture components.
- F. LED Drivers:
 - 1. LED Driver/Power Supply: Integral high efficiency driver with power supply of 120V-277v input 60HZ. Power factor greater than 0.9 at full load. Drive current at 1000ma maximum. Class 2 power supply. Dimming utilizing 0-10V dimming control. Provide continuous flicker free dimming from 100 percent to 10 percent. The driver shall be capable of being serviced through the aperature for downlight applications.
 - 2. Warranty: 3-year minimum for all fixture components.

**SECTION 310000
EARTHWORK**

PART 1 - GENERAL

1.2 GENERAL REQUIREMENTS

- A. This section describes general requirements for all types of earthwork and is applicable to all earthworks required on the project.

1.3 CLASSIFICATION

- A. All excavation is unclassified. The terms earthwork or excavation include all materials excavated or removed regardless of material characteristics. The Contractor shall make his own estimate of the kind and extent of materials, which will be encountered in the excavation.

1.4 QUALITY CONTROL ASSURANCE

- A. Soils and Backfill: Moisture density standard ASTM D1557 or AASHTO T-180 Method "D", unless otherwise specifically approved.
- B. In-place Density Determination: Sandcone method ASTM D1556 or Nuclear Method ASTM D2922.
- C. Classification of Soils ASTM D2487.
- D. Quality assurance monitoring of subgrade backfill and embankment materials shall be paid for by the Owner.
- E. Minimum frequency for testing is indicated below. Additional testing may be necessary depending on circumstances and failure rate.

1. Mechanical Analysis on Imported Material

- a. One sample for approval, prior to use of the following, plus regular checks as shown:

<u>Material</u>	<u>Frequency</u>
Backfill gravel	One per 2000 tons
Foundation gravel	One per 600 L.F.
Bedding, all types	One per 600 L.F.
Crushed Top Course	One per 1000 tons

2. Mechanical Analysis on Native Soils

- a. Street Improvements - minimum one per 600 feet on in place material prior to compaction.

3. Density - Trench Backfill

- a. Dedicated Rights of Way - 3 per 300 L.F. of trench @ spring line, mid trench and surface.

- b. Easements, one at spring line per 300 L.F.
- 4. Density - Street and Road Construction
 - a. One test per 400 L.F. on each lift of classified fill and backfill.
 - b. One test per 400 L.F. on completed subgrade prior to approval of concrete pour, or placement of leveling course.

1.5 SUBMITTALS

- A. Import backfill gradation and moisture density compaction curve test reports.
- B. Embankment and native backfill materials gradations and moisture density standards curve test reports.
- C. Certification of gradation and compliance with referenced standards, and moisture density standards test reports from qualified testing laboratory.
- D. Density test results in approved format.
- E. If at any time the Contractor changes the source and/or stockpile from which materials are obtained, certificates of gradation for these new sources will also be required. The Contractor shall make allowances in his unit prices bid for these items to cover expenses incurred in having this certification made and no additional compensation will be allowed.
- F. During construction, the Owner may elect to have further gradation testing completed on the materials being furnished by the Contractor. This testing will be at the expense of the Owner, however, the Contractor shall provide material samples as may be necessary to complete this testing and these material samples will be furnished from material available on the job site or from the Contractor's source and/or supplier.

PART 2 - PRODUCTS

2.1 BACKFILL MATERIALS

- A. These materials shall be native materials and as described in this section.

2.2 GRAVEL BEDDING MATERIAL

- A. Bedding material shall be a locally available clean natural occurring or crushed sand/gravel mixture free from organic matter and conforming to the following gradation when tested in accordance with ASTM D422.

<u>U.S. Standard Sieve Size</u>	<u>Percent Passing, by Weight</u>
3/4"	100
3/8"	70 - 100
No. 4	55 - 100
No. 10	35 - 95
No. 20	20 - 80

No. 40	10 - 55
No. 100	0 - 10
No. 200	0 - 3

- B. Aggregate material conforming to "Standard Specifications for Highway Construction", latest edition of the Alaska Department of Transportation and Public Facilities, untreated base classification D-1, will be acceptable in lieu of the gradations specified in paragraph 2.2A.

2.3 BACKFILL GRAVEL

- A. Backfill gravel shall be naturally occurring screened or crushed gravel. It shall be free from muck, frozen material, roots, sod or other extraneous or objectionable materials. It shall have such characteristics of size and shape that it will compact readily. It shall have a plasticity index not greater than six (6).
- B. All material shall have maximum size of four (4) inches and not more than ten (10) percent shall pass a No. 200 sieve. The percent of minus 200 will be determined on minus three (3) inch material.
- C. Tallying for pay quantities shall be as established by the Contractor and Engineer prior to construction.

2.4 CRUSHED AGGREGATE BASE COURSE

- A. Aggregate shall be crushed stone or crushed gravel, and shall consist of sound, tough, durable pebbles or rock fragments of uniform quality. All material shall be free from clay balls, vegetable matter or other deleterious matters. In addition, aggregate shall meet the following requirements:

Percent of Wear	AASHTO T-96	50 max.
Degradation Value	ATM T-13	45 min.
Percent Fracture	ATM T-4	70 min.

- B. Crushed aggregate base course shall meet the requirements of the State of Alaska "Standard Specifications for Highway Construction", latest edition, section 703-2.03. Gradation shall conform to the requirements of grading D-1 unless otherwise specified.
- C. A special gradation, E-1, for gravel road applications only shall meet all the requirements for grading D-1 except the percent passing the No. 200 sieve shall be between 6-10%.

2.5 SHOT ROCK EMBANKMENT

- A. Shot rock embankment shall be naturally appearing blasted rock from a quarry. It shall generally be 6" minus in size except that the top 6 inches of the embankment shall be 3 inch minus.

2.6 RIPRAP

- A. Riprap shall consist of broken stone, concrete in sacks, or concrete slabs placed on shoulders, slopes or such other places as may be indicated in the Plans or as directed by the Engineer.
- B. The stone for loose riprap shall be hard, sound and durable. It shall be free from segregation, seams, cracks, and other defects tending to destroy its resistance to weather.
- C. Spalls are defined as broken rock in sizes ranging from 3” to 1/3 cubic foot. Loose riprap shall be free of rock fines, soil or other extraneous material.
- D. Should the riprap contain insufficient spalls within the definition and gradation requirement listed above, the Contractor shall furnish and place supplementary spall material from a source approved by the Engineer, at the Contractor’s expense.
- E. The grading of the riprap shall be determined by the Engineer by visual inspection of the load before it is dumped into place, or, if so ordered by the Engineer, by dumping individual loads on a flat surface and sorting and measuring the individual rocks contained in the load.
- F. Stone shall be hard angular quarry and have a percentage of wear of not more than 50 at 500 revolutions as determined by ASTM C-535. The least dimension of any piece of stone shall be not less than 160 pounds per dry cubic foot. Rock shall have an absorption rate greater than 2.5% as determined by ASTM C 97-83.
- G. The riprap stone shall form a smooth gradation curve without a large spread between median and maximum sizes and shall have the following gradation limits.
 - 1. CLASS I – No more than 10% of the stones by total weight shall weigh more than 400 pounds per piece and no more than 15% by weight of the stones shall weigh less than 50 pounds per piece. The stones shall be evenly graded and a minimum of 50% by weight of the stones shall weigh 200 pounds or more per piece.
 - 2. CLASS II – The following gradation is required:

Specific Stone Size Stone Wt. (lbs)	Percent Smaller By Weight %
300	100
150	50 - 80
75	20 - 50
50	0 - 20

- 3. CLASS III – No more than 10% by total weight of the stones shall weigh more than 140 lbs each, and not more than 50% by total weight of the stones shall weigh less than 70 lbs each.

PART 3 - EXECUTION

3.1 BEDDING MATERIALS

- A. Bedding materials shall be placed in accordance with the requirements for the utility being installed. Refer to appropriate utility specification section.

3.2 CRUSHED AGGREGATE BASE COURSE

- A. Conform to Section 301 of the AKDOT&PF, SSHC except as follows for placement requirements.
 - 1. Density requirement shall be 95% of the maximum density as determined by WAQTC FOP for AASHTO T180 or ATM 212.

3.3 SHOT ROCK EMBANKMENT

- A. Embankment shall be placed in lifts whose loose thickness does not exceed 2 feet. Material shall be dumped on the existing fill and dozed into place. In addition to mechanical compaction, it shall be compacted by routing the hauling and placing equipment over the entire area prior to placing the next lift.

3.4 RIPRAP

- A. A footing trench shall be excavated along the toe of the slope when shown on the plans. The stones shall be handled or dumped into place so as to secure a stone mass of the thickness, height, and length shown on the plans, or as staked with a minimum of voids.
Undesirable voids shall be filled in with small stones or spalls. The rock shall be manipulated sufficiently by means of a bulldozer, rock tongs, or other suitable equipment to secure a reasonably regular surface and mass stability.
- B. Riprap protection shall be placed to its full course thickness at one operation and in such a manner as to avoid displacing the underlying material. Placing of riprap protection in layers or by dumping into chutes or by similar methods likely to cause segregation will not be permitted.

All material going into riprap protection shall be so placed and distributed that there will be no large accumulation or area composed largely of either the larger or smaller sizes of stone.

- C. Unless otherwise authorized, the riprap protection shall be placed in conjunction with the construction of the embankment with only sufficient lag in construction of the riprap protection as may be necessary to prevent mixture of embankment and riprap material.

- D. The Contractor shall provide a level compact area of sufficient size to dump and sort typical loads of riprap at approved locations(s). He shall further dump loads specified in the area and assist the Engineer as needed to sort and measure the stones in the load for the purpose of determining if the riprap is within specifications. Mechanical equipment as needed to assist in the sorting shall be provided by the Contractor at not additional cost to the Owner.

END OF SECTION 310000

SECTION 312500
EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes

1. Furnishing, installing, and maintaining temporary erosion controls and temporary sedimentation controls.

B. Related Sections

1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.
2. Section 31 00 00 -Earthwork.

1.2 REFERENCES

- A. EPA, "Storm Water Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices."
- B. State of Alaska Standard Specifications for Road, Bridge, and Municipal Construction.
- C. Alaska State Department of Ecology - Stormwater Management Manual for Western Alaska.

1.3 DEFINITIONS

- A. Temporary erosion controls shall include grassing, mulching, watering, and reseeding on-site sloped surfaces, providing berms at the top of the slopes and providing interceptor ditches at the ends of berms and at those locations which will ensure that erosion during construction will be either eliminated or minimized.
- B. Temporary sedimentation controls shall include silt dams, traps, barriers, and appurtenances to control soil erosion.
- C. Notice of Intent (NOI) – Application for Alaska Pollution Discharge Elimination System (APDES) permit.

- D. Storm Water Pollution Prevention Plan (SWPPP) – Construction document for erosion control measures to be implemented on site.

1.4 SUBMITTALS

- A. General: Submit the following in accordance with conditions of contract and general conditions sections:
 - 1. Product data for silt barriers and netting.
 - 2. The Contractor has the option to submit additional control measures in the form of shop drawings.
 - 3. The Contractor shall apply for the APDES permit on the owners behalf. Provide a copy of the NOI to both the owner and project architect.
 - 4. The Contractor shall prepare and submit for review two copies of the SWPPP to the owner and project architect.

1.5 QUALITY ASSURANCE

- A. Provide erosion control methods in accordance with methods as indicated on the erosion control plan and/or requirements of authorities having jurisdiction. The Contractor shall comply with all National Pollutant Discharge Elimination System (APDES) rules and regulations in terms of both installation and maintenance during construction.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to the site under provisions of general conditions.
- B. Store and protect products under provisions of general conditions.

PART 2 - PRODUCTS

2.1 SILT-BARRIER PRODUCTS

- A. Filter stone shall be crushed one (1)-inch stone without excessive fines or dust.
- B. Silt barrier shall be Mirafi 140N or approved equal which provides a water flow capacity of 40 gallons per minute per square foot.

PART 3 - EXECUTION

3.1 GENERAL

- A. Comply with erosion control measures as mandated by Metlakatla Indian Community and/or the State of Alaska. At a minimum, comply with standards as set forth in Alaska State Standard Specifications for Road, Bridge, and Municipal Construction in the absence of more stringent local regulations.

- B. Silt dams, traps, barriers, and appurtenances shall be installed and shall be maintained in place for duration of construction. This is done by periodically replacing silted structures or removing the silt from the up gradient side of it.
- C. Erosion and sedimentation controls shall be maintained in a condition which will retain unfiltered water.
- D. The Contractor shall be solely responsible for ensuring that no silt or debris leaves the immediate construction site. Any silt or debris that does leave the immediate site shall be cleaned up, and the area disturbed shall be returned to its natural state as directed by the Owner's Representative at the Contractor's expense.
- E. The Contractor shall be responsible to clean-up all silt debris built up on the site and for the removal of all erosion control measures at the appropriate times as directed by the Owner's Representative.
- F. The Contractor shall be required to maintain temporary construction entrances and remove all mud and debris from public roads on a daily basis, or more often if needed.

END OF SECTION 312500

**SECTION 323113
CHAIN LINK FENCES AND GATES**

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Concrete: Division 3

1.2 QUALITY CONTROL ASSURANCE

- A. Erector shall be a Contractor regularly engaged in installation of similar fencing.

1.3 SUBMITTALS

- A. Certification of quality of all fence elements (including special vinyl coatings and redwood slats when specified).
- B. Shop drawings illustrating locations of all posts, structural details of all fence elements and gate construction.
- C. Submit results of ASTM A90 test for zinc coating weight.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Posts, rails, rods, bars, fittings and hardware shall be hot-dipped, zinc-coated steel per ASTM Specifications A120, A123 and A153, as applicable.
- B. Fence components to be galvanically compatible.

2.2 CHAIN LINK FABRIC

- A. Chain link in accordance with ASTM A392, high carbon steel, zinc-coated Class II (2.0 ounces per square foot).
- B. No. 6 gauge x 2-inch mesh, hot-dipped galvanized after weaving, twisted and barbed at top and bottom selvages.
- C. Fabric roll width to match height of existing fencing.

2.3 POST

- A. Terminal Posts: All end, corner and pull posts, 2.5-inch O.D. standard pipe, 3.65 lbs. per lineal foot (deflection in horizontal fence line of 15 degrees or more requires a terminal post).
- B. Intermediate Posts: 2" O.D. pipe.
- C. Post Braces: 1-5/8 inch O.D. pipe, 1.17 pounds per lineal foot.
- D. All posts shall be provided with tops as required.

2.4 ATTACHMENTS

- A. Truss Rods: 3/8 inch diameter round rod.
- B. Tension Bars (Stretcher Bar): 1/4 inch x 3/4 inch flat, high carbon steel.
- C. Tension Wire (Top and Bottom): No. 7 gauge, galvanized coiled spring wire.
- D. Fittings and Hardware: All standard fittings required for the complete fence assembly including gates shall be malleable cast iron or pressed steel. All ferrous material shall be hot-dipped galvanized.
- E. Barbed Wire: Barbed wire shall be zinc-coated and shall conform to the requirements of the drawings and of Federal Specification RR-F-221.
- F. Barbed wire arms: Supporting arms shall be at an angle of 45 degrees and shall be fitted with clips or other suitable means for attaching three lines of barbed wire. Wire shall be attached on the arm with the top outside wire approximately 12 inches horizontally from the fence line and the other wires spaced uniformly between the top of the fence fabric and the outside barbed wire. Barbed wire arms shall conform to Federal Specifications RR-F-183.

2.5 CONCRETE

- A. Per Division 3 with consistency requirement altered to six (6) inch maximum slump.

PART 3 - EXECUTION

3.1 CHAIN LINK FENCE INSTALLATION

- A. General

1. Install as illustrated on the Contract Drawings.
- B. Clearing and Grubbing:
1. Clearing of the fence line will be required and shall consist of the removal and disposal of all trees, brush, logs, upturned stumps, roots of down trees, rubbish and debris.
 2. Grubbing will not be required except where short and abrupt changes in the ground contour will necessitate removal of stumps in order to properly grade the fence line. All stumps within the clearing limits shall be removed or close cut.
 3. Grading of the fence line sufficiently to prevent ground clearance exceeding six (6") inches or short and abrupt breaks in the ground contour that will affect the aesthetic appearance of the top of the fencing when installed shall be required. It is expected that in the performance of this work that handwork may be required where sufficient width does not exist for machine work.
- C. Posts:
1. Posts shall be set vertically and spaced at 10-foot centers measured parallel to slope of ground.
 2. Set all posts except line posts in concrete footings to minimum depth of 40 inches.
 3. Line posts shall be set in concrete footings with a depth of 28".
 4. Diameter of footings: Minimum of ten (10) inches.
 5. Concrete shall be worked thoroughly to remove voids and crowned to carry water away from the post.
 6. Install pull post to 1,000 feet maximum intervals.
 7. Install post braces and adjustable truss rods at corners, gates, pull posts or as detailed on approved submittal drawings.
 8. Install so posts are plumb when diagonal rod is under tension.
 9. Equip posts with tops designed to exclude moisture from posts.
- D. Tension Wire:
1. Install top tension wire, top rail not required except at corners and gates.

2. Install bottom tension wire along bottom two (2) inches above finish grade.
 3. Stretch tension wire prior to fabric stretching and fasten to terminal posts.
 4. Secure chain link fabric to tension wire with 11 gauge hog rings spaced 24 inches apart.
- E. Chain Link Fabric:
1. Stretch taut and securely fasten to posts.
 2. Fasten chain link fabric to all terminal posts by tension bars with heavy one (1) inch by 11 gauge pressed steel bands spaced 14 inches apart.
 3. Fasten to line posts with two (2) gauge wire clips spaced 14 inches apart.
- F. Gates:
1. Weld all joints in gate frames. Welded connections where the spelter coating has been burned shall be thoroughly cleaned by wire brushing and all traces of welding flux and loose or cracked spelter removed. The clean areas shall then be painted with two (2) coats of galvanizing repair paint.
 2. Chain link fence shall be fastened to the end bars of the gate by stretcher bars and fabric bands, and to the top and bottom bars of the gate frames by tie wires in the same manner as specified for the chain link fence fabric.
 3. Gates shall be properly braced to eliminate any possible sagging condition.
 4. Hinges shall be of sufficient strength and design to permit easy and trouble-free operation.
 5. All double gates shall be equipped with center plunger rods and catches to secure gates in open and closed positions.
 6. Set plunger rod and catch in 12-inch round by 18-inch deep concrete footing.

END OF SECTION 323113