



Haines Borough, Alaska

2016 WASTEWATER TREATMENT PLANT UPGRADE

CONTRACT DOCUMENTS

PROJECT DESIGN:

 **Carson Dorn. Inc.**

712 WEST 12TH STREET
JUNEAU, ALASKA 99801

(907) 586-4447

SECTION 00005 - TABLE OF CONTENTS

**HAINES BOROUGH
2016 WASTEWATER TREATMENT PLANT UPGRADE**

**DIVISION 0 - BIDDING AND CONTRACT REQUIREMENTS, CONTRACT FORMS, AND
CONDITIONS OF THE CONTRACT**

BIDDING and CONTRACT REQUIREMENTS No. of Pages

00005	Table of Contents	2
00030	Notice Inviting Bids	2
00100	Instructions to Bidders	7
00300	Bid	2
00310	Bid Schedule	1
00320	Bid Bond	1
00321	Haines Borough Non-Collusion Affidavit	1
00360	Subcontractor Report	2

CONTRACT FORMS

00500	Agreement	6
00610	Performance Bond	2
00620	Payment Bond	2

CONDITIONS OF THE CONTRACT

00700	General Conditions	47
00800	Supplementary General Conditions	4
00830	Alaska Labor Standards, Reporting, and Prevailing Wage Rate Determination.....	1

DIVISION 1 - GENERAL REQUIREMENTS

01010	Summary of WORK	2
01025	Measurement and Payment	10
01070	Abbreviations of Institutions.....	3
01090	Reference Standards	2
01300	Contractor Submittals	7
01400	Quality Control.....	2
01505	Mobilization.....	1
01530	Protection/Restoration of Existing Facilities.....	5
01550	Site Access and Storage.....	5
01570	Erosion Control.....	2
01600	Materials and Equipment.....	2
01700	Project Closeout.....	4
01704	Final Clean-Up and Site Restoration	1

DIVISION 2 - SITEWORK

02050	Demolition	3
02201	Clearing and Grubbing	1
02202	Excavation and Embankment	3

SECTION 00005 - TABLE OF CONTENTS

02203	Trenching.....	5
02204	Base Course	2
02401	Sewer Pipe	6
02402	Sanitary Sewer Manholes and Cleanouts.....	4
02702	Construction Surveying	2

DIVISION 03 CONCRETE

03301	Structural Concrete	12
-------	---------------------------	----

DIVISION 11 – MECHANICAL AND EQUIPMENT

11000	Equipment General Provisions	10
11120	Piping, Valves, Fittings and Miscellaneous Equipment.....	4
11336	Influent Screen/Grit Removal System.....	19

DIVISION 13 - BUILDINGS

13122	Pre-Fabricated Metal Buildings	7
13300	Building General Provisions	9

DIVISION 15 - PIPING

15020	Pipe Supports.....	4
-------	--------------------	---

DIVISION 16 - ELECTRICAL

16060	Grounding and Bonding	3
16073	Hangers and Supports for Electrical Systems	5
16075	Electrical Identification.....	6
16120	Conductors and Cables	4
16123	Control Voltage Electrical Power Cables.....	6
16130	Raceways and Boxes	8
16140	Wiring Devices	6
16269	Variable Frequency Controls	8
16420	Enclosed Controllers.....	4
16442	Panelboards.....	7
16511	Interior Lighting.....	5

DIVISION 23 - HEATING

220510	General Mechanical Plumbing.....	7
220553	Identification for Plumbing Piping and Equipment	3
221005	Plumbing Piping	11
230553	Identification for HVAC Piping and Equipment	3
230719	HVAC Piping Insulation.....	4
230936	Electronic Controls	4
231113	Facility Fuel-Oil Piping	7
232113	Hydronic Piping.....	9
232114	Hydronic Speicalties	3
232123	Hydronic Pumps	3
235100	Breechings, Chimney, and Stacks.....	4
235223	Boilers.....	5
238101	Terminal Heat Transfer Units	3

SECTION 00005 - TABLE OF CONTENTS

LIST OF DRAWINGS

G-1	COVER
G-2	HAINES VICINITY MAP AND DRAWING INDEX
G-3	SYMBOLS
D-1	EXISTING TREATMENT BUILDING DEMOLITION
D-2	DEMOLITION EXISTING WASTEWATER TREATMENT PLANT FLOOR PLAN
D-3	REMOVE EXISTING WASTEWATER TREATMENT PLANT BUILDING
P-0	PHOTO LOCATIONS
P-1	PHOTOS
P-2	PHOTOS
P-3	PHOTOS
P-4	PHOTOS
P-5	PHOTOS
P-6	PHOTOS
P-7	PHOTOS
P-8	PHOTOS
A-1	NEW WASTEWATER TREATMENT PLANT BUILDING
A-2	BOILER ROOM AND CONTROL ROOM PLAN
A-3	NEW BOILER ROOM STRUCTURAL SECTION AND DETAILS
A-4	EXISTING TREATMENT BUILDING PLAN
A-5	EXISTING SOLIDS BUILDING FRAMING ELEVATIONS
A-6	SOLIDS BUILDING NEW ROOFING AND SIDING
A-7	NEW CONTROL ROOM STRUCTURAL SECTIONS AND DETAILS
C-1	NEW EFFLUENT LINE
C-2	NEW EFFLUENT LINE DETAIL
M-1	MAGENETIC FLOW METER & WASH DOWN PIPING
M-2	MAGENETIC FLOW METER & WASH DOWN PIPING DETAILS
AA-1.1	AA-1 INFLUENT SCREENS EQUIPMENT AND PIPING DEMOLITION
AA-1.2	AA-1 INFLUENT SCREENS EQUIPMENT AND PIPING PLAN
AA-1.3	AA-1 INFLUENT SCREENS DETAILS
E-1	LEGEND, DETAILS
E-2	TREATMENT PLANT-EXISTING POWER
E-3	TREATMENT PLANT - EXISTING POWER

SECTION 00005 - TABLE OF CONTENTS

E-4	TREATMENT PLANT - NEW POWER
E-5	TREATMENT PLANT - NEW POWER
E-6	ENLARGED BOILER & ELECTRICAL ROOM POWER
E-7	SINGLE LINE DIAGRAM, MECHANICAL EQUIPMENT SCHEDULE
E-8	CONTROL DIAGRAMS, PANEL SCHEDULE
E-9	TREATMENT PLANT - LIGHTING
E-10	TREATMENT PLANT - LIGHTING
E-11	ENLARGED BOILER & ELECTRICAL ROOM LIGHTING, LUMINAIRE SCHEDULE
H-1	SYMBOLS AND SCHEDULES
H-2	FLOOR PLAN
H-3	ENLARGED PLAN AND PIPING DIAGRAMS
H-4	DETAILS AND CONTROLS

END OF SECTION

SECTION 00030 NOTICE INVITING BIDS

**HAINES BOROUGH
2016 WASTEWATER TREATMENT PLANT UPGRADE**

The Contract Documents may be obtained at the offices of the Borough Clerk, 103 Third Avenue S., Haines, Alaska 99827 upon payment of \$50 (non-refundable) for each set of Contract Documents (including technical specifications and accompanying reduced scale drawings). The scale of the reduced drawings is about one-half of the original scale. If full scale drawings are desired they may be purchased at an additional cost of \$50 (non-refundable) from the ENGINEER. The Contract Documents are also available as a pdf file on the Borough's website www.hainesalaska.gov under Bids and RFPs at no charge.

PRE-BID MEETING. A Pre-Bid meeting will be held for Bidders on November 17, 2016 at 10:00 am in the Haines Borough Office conference room at 103 Third Avenue South, Haines, AK 99827. The Project Engineer will be available to answer questions about the project and the Pre-Bid Meeting will include a site visit to the wastewater treatment plant to review the work.

RECEIPT OF BIDS. Sealed Bids will be received at the offices of the Borough Clerk, 103 Third Avenue S., Haines, Alaska 99827 until **3:00 p.m. on December 6, 2016**, for 2016 Wastewater Treatment Plant Upgrade. Opening date and time may be changed to a later date or time as announced by Addendum.

Bids must be delivered in person or by courier service to the physical location indicated. Bids Delivered by the U.S. Postal Service must be mailed to the address indicated. Mailing/delivery times to Alaska may take longer than other areas of the United States. Late bids will not be accepted.

PHYSICAL LOCATION:

Borough Clerk
Haines Borough Offices
103 Third Ave. South
Haines, AK 99827

MAILING ADDRESS

Borough Clerk
Haines Borough Offices
P.O. Box 1209
Haines, AK 99827

OPENING OF BIDS. The Bids will be publicly opened and read shortly after 3:00 p.m. on December 6, 2016, in the Haines Borough Offices 103 Third Avenue South, Haines, AK.

DESCRIPTION OF WORK. The WORK consists of removing and replacing a 75' x 85' pre-engineered building, removing and replacing siding and roofing on a 20' x 42' building, improvements to the wastewater treatment plant effluent piping, furnishing and installing a new influent screening/grit removal system, along with other associated miscellaneous structural, electrical and mechanical items of work.

SITE OF WORK. The site of the WORK is located in Haines, Alaska.

COMPLETION OF WORK. All WORK within these Contract Documents shall be completed by September 1, 2017.

BIDDING, CONTRACT, or TECHNICAL QUESTIONS. All communications relative to this WORK, prior to opening Bids, shall be directed to the following:

Carson Dorn, Inc., 712 West 12th Street, Juneau, Alaska 99801
Attention: Jim Dorn
Telephone: (907) 586-4447

SECTION 00030 NOTICE INVITING BIDS

BID SECURITY. Each Bid shall be accompanied by a certified or cashier's check or Bid Bond, in the amount of 5% percent of the Bid, payable to the Haines Borough, Alaska, as a guarantee that the Bidder, if its Bid is accepted, will promptly execute the Agreement. A Bid shall not be considered unless one of the forms of Bidder's security is enclosed with it.

CONTRACTOR'S LICENSE. All contractors are required to have a current Alaska Contractor's License and Alaska Business License. A Haines Business License is required prior to contract award.

BID TO REMAIN OPEN. The Bidder shall guarantee the Bid for a period of 120 Days from the date of Bid opening. Any component of the Bid may be awarded anytime during the 120 Days.

GENERAL INFORMATION. This Project is currently funded by a grant from the State of Alaska (Alaska Department of Environmental Conservation). Projects and services provided under this grant are made available to the general public in compliance with the Americans with Disabilities Act of 1990. The Borough agrees to administer this grant in a non-discriminatory manner. No person shall be discriminated against based on race, religion, color, national origin, gender or disability.

OWNER'S RIGHTS RESERVED. The OWNER reserves the right to reject any or all Bids, to waive any informality in a Bid, and to make award to the lowest responsive, responsible Bidder as it may best serve the interests of the OWNER.

OWNER: Haines Borough

END OF SECTION

SECTION 00100 - INSTRUCTIONS TO BIDDERS

1.0 DEFINED TERMS. Terms used in these “Instructions to Bidders” and the “Notice Inviting Bids” which are defined in the General Conditions have the meanings assigned to them in the General Conditions. The term "Bidder" means one who submits a Bid directly to the OWNER, as distinct from a sub-bidder, who submits a Bid to a Bidder.

2.0 INTERPRETATIONS AND ADDENDA.

A. **INTERPRETATIONS.** All questions about the meaning or intent of the Contract Documents are to be directed to the Owner. Interpretations or clarifications considered necessary by the Owner in response to such questions will be issued by Addendum, mailed, faxed, or delivered to all parties recorded by the Owner, or OWNER, as having received the Contract Documents. Questions received less than 7 Days prior to the date for opening of Bids may not be answered. Only questions answered by formal written Addendum will be binding. Oral and other interpretations or clarifications will be without legal effect.

B. **ADDENDA.** Addenda may be issued to modify the Contract Documents as deemed advisable by the OWNER. It is the Owner’s intent to email addenda to Contractors on the Planholders List. Addenda may be viewed on the Haines website www.hainesalaska.gov. The OWNER will make all reasonable attempts to ensure that all Planholders receive addenda, however, it is the Bidders responsibility to independently confirm the contents, number, and dates of each Addenda prior to submitting a Bid.

3.0 FAIR COMPETITION. More than one Bid from an individual, firm, partnership, corporation, or association under the same or different names will not be considered. If the OWNER believes that any Bidder is interested in more than one Bid for the WORK contemplated, all Bids in which such Bidder is interested will be rejected. If the OWNER believes that collusion exists among the Bidders, all Bids will be rejected.

4.0 RESPONSIBLE BIDDER. Only responsive Bids from responsible Bidders will be considered. A Bid submitted by a Bidder determined to be not responsible may be rejected. A responsible Bidder is one who is considered to be capable of performing the WORK.

A. The general standards for responsibility are to determine the CONTRACTOR’s ability to perform WORK adequately, considering the CONTRACTOR’s

1. Financial Resources
2. Ability to Meet Delivery Standards
3. Past Performance Record
 - a. References from others on CONTRACTOR’s performance
 - b. Record of performance on prior OWNER contracts
4. Record of Integrity
5. Obligations to OWNER
 - a. Bidders must be registered as required by law and in good standing for all amounts owed to the OWNER within ten Days of Owner's Notice of Intent to Award.

SECTION 00100 - INSTRUCTIONS TO BIDDERS

- B. Before a Bid is considered for award, a Bidder may be requested to submit information documenting its ability and competency to perform the WORK, according to general standards of responsibility and any special standards which may apply. It is Bidder's responsibility to submit sufficient, relevant, and adequate information. OWNER will make its determination of responsibility and has no obligation to request clarification or supplementary information.

5.0 RESPONSIVE BIDS. Only responsive Bids will be considered. Bids may be considered non-responsive and may be rejected. Some of the reasons a Bid may be rejected for being non-responsive are:

- A. If the Bid is on a form other than that furnished by the OWNER, or legible copies thereof; or if the form is altered or any part thereof is detached; or if the Bid is improperly signed.
- B. If there are unauthorized additions, conditional or alternate bids, or irregularities of any kind which may tend to make the proposal incomplete, indefinite, or ambiguous as to its meaning.
- C. If the Bidder adds any unauthorized conditions, limitations, or provisions reserving the right to accept or reject any award, or to enter into a contract pursuant to an award. This does not exclude a Bid limiting the maximum gross amount of awards acceptable to any one Bidder at any one bid opening, provided that any selection of awards will be made by the OWNER.
- D. If the Bid does not contain a unit price for each pay item listed, except in the case of authorized alternate pay items.
- E. If the Bidder has not acknowledged receipt of each Addendum.
- F. If the Bidder fails to furnish an acceptable Bid guaranty with the Bid.
- G. If any of the unit prices Bid are excessively unbalanced (either above or below the amount of a reasonable Bid) to the potential detriment of the OWNER.
- H. If a bid modification does not conform to Article 15.0 of this Section.

6.0 BIDDER'S EXAMINATION OF CONTRACT DOCUMENTS AND SITE. It is the responsibility of each Bidder before submitting a Bid:

- A. To examine thoroughly the Contract Documents, and other related data identified in the bidding documents (including "technical data" referred to below):
 - 1. To visit the site to become familiar with and to satisfy the Bidder as to the general and local conditions that may affect cost, progress, or performance, of the WORK,
 - 2. To consider federal, state and local laws and regulations that may affect cost, progress, or performance of the WORK,
 - 3. To study and carefully correlate the Bidder's observations with the Contract Documents, and other related data; and
 - 4. To notify the ENGINEER of all conflicts, errors, or discrepancies in or between the Contract Documents and such other related data.

SECTION 00100 - INSTRUCTIONS TO BIDDERS

7.0 REFERENCE IS MADE TO THE SUPPLEMENTARY GENERAL CONDITIONS FOR IDENTIFICATION OF:

- A. Those reports of explorations and tests of subsurface conditions at the site which have been utilized by the Engineer of Record in the preparation of the Contract Documents. The Bidder may rely upon the accuracy of the technical data contained in such reports, however, the interpretation of such technical data, including any interpolation or extrapolation thereof, together with non-technical data, interpretations, and opinions contained therein or the completeness thereof is the responsibility of the Bidder.
- B. Those drawings of physical conditions in or relating to existing surface and subsurface conditions (except underground utilities) which are at or contiguous to the site have been utilized by the Engineer of Record in the preparation of the Contract Documents. The Bidder may rely upon the accuracy of the technical data contained in such drawings, however, the interpretation of such technical data, including any interpolation or extrapolation thereof, together with nontechnical data, interpretations, and opinions contained in such drawings or the completeness thereof is the responsibility of the Bidder.
- C. Copies of such reports and drawings will be made available by the OWNER to any Bidder on request if said reports and drawings are not bound herein. Those reports and drawings are not part of the Contract Documents, but the technical data contained therein upon which the Bidder is entitled to rely, as provided in Paragraph SGC-4.2 of the Supplementary General Conditions, are incorporated herein by reference.
- D. Information and data reflected in the Contract Documents with respect to underground utilities at or contiguous to the site is based upon information and data furnished to the OWNER and the Engineer of Record by the owners of such underground utilities or others, and the OWNER does not assume responsibility for the accuracy or completeness thereof unless it is expressly provided otherwise in the Supplementary General Conditions, or in Section 01530 - Protection and Restoration of Existing Facilities.
- E. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders on subsurface conditions, underground utilities and other physical conditions, and possible changes in the Contract Documents due to differing conditions appear in Paragraphs 4.2, 4.3, and 4.4 of the General Conditions.
- F. Before submitting a Bid, each Bidder will, at its own expense, make or obtain any additional examinations, investigations, explorations, tests, and studies and obtain any additional information and data which pertain to the physical conditions (surface, subsurface, and underground utilities) at or contiguous to the site or otherwise which may affect cost, progress, or performance of the WORK and which the Bidder deems necessary to determine its Bid for performing the WORK in accordance with the time, price, and other terms and conditions of the Contract Documents.
- G. On request in advance, the OWNER will provide each Bidder access to the site to conduct such explorations and tests as each Bidder deems necessary for submission of a Bid. Bidder shall fill all holes and shall clean up and restore the site to its former condition upon completion of such explorations.

SECTION 00100 - INSTRUCTIONS TO BIDDERS

- H. The lands upon which the WORK is to be performed, rights-of-way and easements for access thereto and the lands designated for use by the CONTRACTOR in performing the WORK are identified in the Contract Documents. All additional lands and access thereto required for temporary construction facilities or storage of materials and equipment are to be provided by the CONTRACTOR. Easements for permanent structures or permanent changes in existing structures are to be obtained and paid for by the OWNER unless otherwise provided in the Contract Documents.
- I. The submission of a Bid will constitute an incontrovertible representation by the Bidder that the Bidder has complied with every requirement of Article 6, "Bidder's Examination of Contract Documents and Site" herein, that without exception the Bid is premised upon performing the WORK required by the Contract Documents and such means, methods, techniques, sequences, or procedures of construction as may be indicated in or required by the Contract Documents, and that the Contract Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance of the WORK.

8.0 BID FORM.

- A. The Bid shall be made on the Bid Schedule(s) bound herein, or on the yellow bid packet provided, or on legible and complete copies thereof, and shall contain the following: Sections 00300, 00310, and the required Bid Security. The envelope enclosing the sealed Bids shall be plainly marked in the upper left-hand corner with the name and address of the Bidder and shall bear the words "BID FOR," followed by the title of the Contract Documents for the WORK, the name of the OWNER, the address where Bids are to be delivered or mailed to, and the date and hour of opening of Bids. The Bid Security shall be enclosed in the same envelope with the Bid.
- B. All blanks on the Bid Form and Bid Schedule must be completed in ink or typed.
- C. Bids by corporations must be executed in the corporate name by the president, a vice-president (or other corporate officer). The corporate address and state of incorporation must appear below the signature.
- D. Bids by partnerships must be executed in the partnership name and be signed by a managing partner, and the official address of the partnership must appear below the signature.
- E. The Bidder's Bid must be signed with ink. All names must be printed or typed below the signature.
- F. The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Bid Form. Failure to acknowledge Addenda shall render Bid non-responsive and shall cause its rejection.
- G. The address to which communications regarding the Bid are to be directed must be shown.
- H. All Bidders must provide evidence of authority to conduct business in Alaska to the extent required by law.
- I. On Projects including Federal funding any contractor otherwise qualified to perform the WORK, is not required to be licensed nor to submit application for license in advance of

SECTION 00100 - INSTRUCTIONS TO BIDDERS

submitting a Bid or having such Bid considered; provided, however, that such exemption does not constitute a waiver of the OWNER's right under existing license laws to require a contractor, determined to be a successful Bidder, to be licensed to do business as a contractor in the State of Alaska in connection with the award of a contract to the successful Bidder.

- J. On Projects not including Federal funding, a Bid for the WORK will not be accepted from a contractor who does not hold a valid Alaska Business License and a valid Contractor's License in Alaska (applicable to the type of work bid upon) at the time of opening Bids.

9.0 QUANTITIES OF WORK. The quantities of WORK, or material, stated in unit price items of the Bid are supplied only to give an indication of the general scope of the WORK; the OWNER does not expressly or by implication agree that the actual amount of WORK, or material, will correspond therewith, and reserves the right after award to increase or decrease the amount of any unit price item of the WORK by an amount up to and including 25 percent of any Bid item, without a change in the unit price, and shall include the right to delete any Bid item in its entirety, or to add additional Bid items up to and including an aggregate total amount not to exceed 25 percent of the Contract Price (see General Conditions, Article 10 Changes In the Work).

10.0 SUBSTITUTE OR "OR-EQUAL" ITEMS. The procedure for the submittal of substitute or "or-equal" products is specified in Section 01300 - CONTRACTOR Submittals.

11.0 SUBMISSION OF BIDS. The Bid shall be delivered by the time and to the place stipulated in the Notice Inviting Bids. It is the Bidder's sole responsibility to see that its Bid is received in proper time. Oral, telegraphic, telephonic or faxed Bids will not be considered.

Bids must be delivered in person or by courier service to the physical location indicated. Bids Delivered by the U.S. Postal Service must be mailed to the address indicated. Mailing/delivery times to Alaska may take longer than other areas of the United States. Late bids will not be accepted.

PHYSICAL LOCATION:

Haines Borough
103 Third Avenue S.
P.O. box 1209
Haines, AK 99827

12.0 BID SECURITY, BONDS, AND INSURANCE. Each Bid shall be accompanied by a certified, or cashier's check, or approved Bid Bond in an amount of at least 5 percent of the total Bid price. The "total Bid price" is the amount of the base bid, plus the amount of alternate bids, if any, which total to the maximum amount for which the contract could be awarded. Said check or Bond shall be made payable to the OWNER and shall be given as a guarantee that the Bidder, if offered the WORK, will enter into an Agreement with the OWNER, and will furnish the necessary insurance certificates, Payment Bond, and Performance Bond; each of said Bonds, if required, and insurance amounts shall be as stated in the Supplementary General Conditions. In case of refusal or failure to enter into said Agreement, the check or Bid Bond, as the case may be, shall be forfeited to the OWNER. If the Bidder elects to furnish a Bid Bond as its Bid security, the Bidder shall use the Bid Bond form bound herein, or one conforming substantially to it in form. Bid Bonds must be accompanied by a legible power of attorney.

13.0 RETURN OF BID SECURITY. Within 14 Days after award of the contract, the OWNER will return the Bid securities accompanying such of the Bids as are not considered in making the award. All other

SECTION 00100 - INSTRUCTIONS TO BIDDERS

Bid securities will be held until the Agreement has been executed. They will then be returned to the respective Bidders whose Bids they accompanied.

14.0 DISCREPANCIES IN BIDS In the event there is more than one Pay Item in a Bid Schedule, the Bidder shall furnish a price for all Pay Items in the schedule, and failure to do so may render the Bid non-responsive and cause its rejection. In the event there are unit price Pay Items in a Bid Schedule and the “amount” indicated for a unit price Pay Items does not equal the product of the unit price and quantity, the unit price shall govern and the amount will be corrected accordingly, and the Bidder shall be bound by said correction. In the event there is more than one Pay Item in the Bid Schedule and the total indicated for the schedule does not agree with the sum of the prices bid on the individual items, the prices bid on the individual items shall govern and the total for the schedule will be corrected accordingly, and the Bidder shall be bound by said correction.

15.0 BID MODIFICATIONS AND UNAUTHORIZED ALTERNATIVE BIDS.

A. Any Bidder may modify a Bid by mail, or fax (**Fax: 907-766-2716**) prior to the scheduled closing time for receipt of Bids, provided. Bidders are strongly advised to telephone the Borough Clerk (Telephone: 907-766-2231), to confirm the successful and timely transmission of their Bid modification.

A fax modification should not reveal the Bid price but should provide the addition or subtraction or other modification so that the final prices will not be known by the Haines Borough until the sealed Bid is opened. Modifications shall include both the modification of the unit bid price and the total modification of each item modified. The Haines Borough shall not be responsible for its failure to receive fax modifications whether such failure is caused by transmission line problems, fax device problems, operator error or otherwise.

B. Unauthorized conditions, limitations, or provisos attached to the Bid will render it informal and cause its rejection as being non-responsive. The completed bid forms shall be without interlineation, alterations, or erasures in the printed text. All changes shall be initialed by the person signing the Bid. Alternative bids will not be considered unless called for.

16.0 WITHDRAWAL OF BID. The Bid may be withdrawn by the Bidder by means of a written request, signed by the Bidder or its properly authorized representative. Such written request must be delivered to the place stipulated in the Notice Inviting Bids for receipt of Bids prior to the scheduled closing time for receipt of Bids.

17.0 AWARD OF CONTRACT.

A. Award of a contract, if it is awarded, will be on the basis of materials and equipment described in the Drawings or specified in the Technical Specifications and will be made to the lowest responsive, responsible Bidder whose Bid complies with all the requirements prescribed. Unless otherwise specified, any such award will be made within the period stated in the Notice Inviting Bids that the Bids are to remain open. Unless otherwise indicated, a single award will be made for all the bid items in an individual Bid Schedule.

B. In the event the WORK is contained in more than one Bid Schedule, the OWNER may award schedules individually or in combination. In the case of two Bid Schedules which are alternative to each other, only one of such alternative schedules will be awarded.

SECTION 00100 - INSTRUCTIONS TO BIDDERS

- C. If the OWNER has elected to advertise this Project with a Base Bid and Additive or Deductive Alternates, the OWNER may elect to award the contract for the Base Bid, or the Base Bid plus one or more Alternates selected by the OWNER. In either case, award shall be made to the responsive, responsible Bidder offering the lowest total Bid for the WORK to be awarded as selected by the OWNER.

18.0 EXECUTION OF AGREEMENT.

- A. The Bidder to whom award is made for a Bid shall execute a written agreement with the OWNER on the Agreement form, Section 00500, and shall secure all insurance and any other documents required by the contract within 10 Days (calendar) from the date of the Notice of Intent to Award letter. Notice of Intent to Award will occur after the Subcontractor Report is received.
- B. Failure or refusal to enter into the Agreement as herein provided or to conform to any of the stipulated requirements in connection therewith shall be just cause for annulment of the award and forfeiture of the Bid security. If the lowest responsive, responsible Bidder refuses or fails to execute the Agreement, the OWNER may award the contract to the second lowest responsive, responsible Bidder. If the second lowest responsive, responsible Bidder refuses or fails to execute the Agreement, the OWNER may award the contract to the third lowest responsive, responsible Bidder. On the failure or refusal of such second or third lowest Bidder to execute the Agreement, each such Bidder's Bid securities shall be likewise forfeited to the OWNER.

19.0 LIQUIDATED DAMAGES. Provisions for liquidated damages, if any, are set forth in Section 00500 - Agreement.

20.0 FILING A PROTEST.

- A. A Bidder may submit written protest of the proposed award of a competitive sealed bid by the Haines Borough within 7 days of the bid opening. The protest shall clearly detail the basis for the protest.
- B. Late protests shall not be considered by the Haines Borough.

21.0 PERMITS. The CONTRACTOR is responsible for all WORK associated with meeting any local, state, and/or federal permit requirements.

END OF SECTION

SECTION 00300 - BID

BID TO: THE HAINES BOROUGH

1. The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with the OWNER on the form included in the Contract Documents (as defined in Article 7 of Section 00500 - Agreement) to perform the WORK as specified or indicated in said Contract Documents entitled

2016 Wastewater Treatment Plant Upgrade

2. Bidder accepts all of the terms and conditions of the Contract Documents, including without limitation those in the "Notice Inviting Bids" and "Instructions to Bidders," dealing with the disposition of the Bid Security.
3. This Bid will remain open for the period stated in the "Notice Inviting Bids" unless otherwise required by law. Bidder will enter into an Agreement within the time and in the manner required in the "Notice Inviting Bids" and the "Instructions to Bidders," and will furnish insurance certificates, Payment Bond, Performance Bond, and any other documents as may be required by the Contract Documents.
4. Bidder has familiarized itself with the nature and extent of the Contract Documents, WORK, site, locality where the WORK is to be performed, the legal requirements (federal, state and local laws, ordinances, rules, and regulations), and the conditions affecting cost, progress or performance of the WORK and has made such independent investigations as Bidder deems necessary.
5. This Bid is genuine and not made in the interest of or on behalf of any undisclosed person, firm or corporation and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation; Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid; Bidder has not solicited or induced any person, firm or corporation to refrain from bidding; and Bidder has not sought by collusion to obtain for itself any advantage over any other Bidder or over OWNER.
6. To all the foregoing, and including all Bid Schedule and information required of Bidder contained in this Bid Form, said Bidder further agrees to complete the WORK required under the Contract Documents within the Contract Time stipulated in said Contract Documents, and to accept in full payment therefor the Contract Price based on the total bid price(s) named in the aforementioned Bid Schedule.
7. Bidder has examined copies of all the Contract Documents including the following Addenda (receipt of all of which is hereby acknowledged by the Undersigned):

Addendum No.	Date Issued	Addendum No.	Date Issued

Give number and date of each Addendum above. Failure to acknowledge receipt of all Addenda will cause the Bid to be non-responsive and shall cause its rejection.

SECTION 00300 - BID

Dated: _____	Bidder: _____ (Company Name)
Alaska Business License No: _____	By: _____ (Signature in Ink)
Alaska CONTRACTOR's License No: _____	Printed Name: _____
Haines Business License No: _____	Title: _____
Telephone No: _____	Address: _____ (Street or P.O. Box)
Fax No: _____	_____ (City, State, Zip)

8. The Bidder has read this Bid and agrees to the conditions as stated herein by signing its signature in the space provided below.

9. TO BE CONSIDERED, ALL BIDDERS MUST COMPLETE AND INCLUDE THE FOLLOWING AT THE TIME OF THE BID OPENING:

- Signed Bid, Section 00300 (includes Addenda receipt statement)
- Completed Bid Schedule, Section 00310
- Bid Security (Bid Bond, Section 00320, or by a certified or cashier's check as stipulated in the Notice Inviting Bids, Section 00030)
- Copy of Alaska Business License
- Copy of Alaska Contractors License
- Haines Borough Non-Collusion Affidavit (Section 00321)

10. The apparent low Bidder is required to complete and submit the following documents by 4:30 p.m. on the fifth business day following the date of the Bid Opening.

- Subcontractor Report, Section 00360

The apparent low Bidder who fails to submit a completed Subcontractor Report within the time specified in Section 00360 – Subcontractor Report will be found to be not a responsible Bidder and may be required to forfeit the Bid security. The OWNER will then consider the next lowest Bidder for award of the contract.

11. The successful Bidder will be required to submit, within ten Days (calendar) after the date of the “Notice of Intent to Award” letter, the following executed documents:

- Agreement Forms, Section (Section 00500)
- Performance Bond, Section (Section 00610)
- Payment Bond, Section (Section 00620)
- Certificates of Insurance, (CONTRACTOR and Subcontractors) Section 00700 and Section 00800

END OF SECTION

**SECTION 00310 - BID SCHEDULE
2016 WASTEWATER TREATMENT PLANT UPGRADE**

ITEM NO.	PAY ITEM DESCRIPTION	PAY UNIT	APPROX. QUANTITY	UNIT PRICE		AMOUNT	
				DOLLARS	CENTS	DOLLARS	CENTS
1505.1	Mobilization	Lump Sum	All Req'd	Lump	Sum		
1570.1	Erosion Control Plan and SWPPP	Lump Sum	All Req'd	Lump	Sum		
1704.1	Final Clean Up and Site Restoration	Lump Sum	All Req'd	Lump	Sum		
2050.1	Remove and Dispose, Existing Solids Building Siding on North Wall	Lump Sum	All Req'd	Lump	Sum		
2050.2	Remove and Dispose, Existing Treatment Building	Lump Sum	All Req'd	Lump	Sum		
2050.3	Remove and Dispose, Covered Walkway	Lump Sum	All Req'd	Lump	Sum		
2201.1	Clearing and Grubbing	Lump Sum	All Req'd	Lump	Sum		
2203.1	Sheeting, Shoring and Bracing	Lump Sum	All Req'd	Lump	Sum		
2401.1	15" SDR 35 PVC Sewer Pipe	LF	53	\$250			
2401.2	16" SDR 17 HDPE Sewer Effluent Line	Lump Sum	All Req'd	Lump	Sum		
2402.1	Sewer Manhole	Each	1				
2702.1	Construction Surveying	Lump Sum	All Req'd	Lump	Sum		
11120.1	Magnetic Flow Meter	Each	1				
11120.2	2" PVC Washdown Piping and Appurtenances	Lump Sum	All Req'd	Lump	Sum		
11120.3	Remove and Replace Existing Blower	Lump Sum	All Req'd	Lump	Sum		
13122.1	New Pre-Fabricated Treatment Building	Lump Sum	All Req'd	Lump	Sum		
13122.2	New Siding for North Wall of Solids Building	Lump Sum	All Req'd	Lump	Sum		
13300.1	New Boiler Room	Lump Sum	All Req'd	Lump	Sum		
13300.2	New Control Room	Lump Sum	All Req'd	Lump	Sum		
13300.3	New Fiberglass Doors	Each	5				
13300.4	New 8' w by 10' h Insulated Overhead Rolling Doors	Each	2				
16000.1	Electrical, Base Bid	Lump Sum	All Req'd	Lump	Sum		
23000.1	New Heating System	Lump Sum	All Req'd	Lump	Sum		

TOTAL BID \$ _____

ADDITIVE ALTERNATE NO. 1 INFLUENT SCREEN/GRIT REMOVAL SYSTEM

2050.4	Remove and Dispose, Existing Grit Removal System and Splitter Box	Lump Sum	All Req'd	Lump	Sum		
11120.4	Piping, Fittings and Valves for Add. Alt. No. 1	Lump Sum	All Req'd	Lump	Sum		
11336.1	Influent Screens/Grit Removal System	Lump Sum	All Req'd	Lump	Sum		
16000.2	Electrical, New Influent Screens/Grit Removal System	Lump Sum	All Req'd	Lump	Sum		

ADDITIVE ALTERNATE NO. 1 \$ _____

ADDITIVE ALTERNATE NO. 2 REMOVE AND REPLACE EAST, WEST AND SOUTH WALL SIDING AND ROOF OF EXISTING SOLIDS HANDLING AND COMPOST BUILDING

2050.5	Remove and Dispose, Existing Solids Building Siding on East, West And South Wall and Solids Building Roofing	Lump Sum	All Req'd	Lump	Sum		
13122.3	New Siding for East, West and South Walls of Solids Building and New Roofing for Solids Building	Lump Sum	All Req'd	Lump	Sum		

ADDITIVE ALTERNATE NO. 2 \$ _____

SECTION 00320 - BID BOND

KNOW ALL MEN BY THESE PRESENTS,

That _____ as Principal, and _____

_____ as Surety, are

held and firmly bound unto Haines Borough

hereinafter called "OWNER," in the sum of _____

_____ dollars,

(not less than 5 percent of the total amount of the Bid)

for the payment of which sum, well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, said Principal has submitted a Bid to said OWNER to perform the WORK required under the bidding schedule(s) of the OWNER's Contract Documents entitled **2016 Wastewater Treatment Plant Upgrade**

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

SIGNED AND SEALED, this _____ day of _____, 19_____

_____ (SEAL) _____ (SEAL)

(Principal)

(Surety)

By: _____

(Signature)

By: _____

(Signature)

(SEAL AND NOTARIAL ACKNOWLEDGEMENT OF SURETY)

NON-COLLUSION AFFIDAVIT

UNITED STATES OF AMERICA)

STATE OF ALASKA)

I, _____ of _____,
(Printed Name of Person Signing) (Printed Name of Business)

being duly sworn, so depose and state:

That I, or the firm, association or corporation of which I am a member, a BIDDER on the contract to be awarded, by the Assembly of the HAINES BOROUGH for the contract services designated as:

2016 Wastewater Treatment Plant Upgrade

Located in Haines, Alaska, have not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with such contract.

Signature

Date

Subscribed and sworn to this ___ day of _____, 201_.

Notary Public _____

My Commission Expires: _____

SECTION 00360 - SUBCONTRACTOR REPORT

LIST OF SUBCONTRACTORS (AS 36.30.115)

The apparent low Bidder must submit a list of Subcontractors that the Bidder proposes to use in the performance of this contract *by the fifth business day* following the Bid Opening. If the fifth day falls on a weekend or holiday, the report is due by close of business on the next business Day following the weekend or holiday. The Subcontractor Report list must include each Subcontractor's name, address, location, evidence of valid Alaska Business License, and valid Alaska Contractor's Registration under AS 08.18. *If no Subcontractors are to be utilized in the performance of the WORK, write in ink or type "NONE" on line (1) below.*

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

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

CONTRACTOR, Authorized Signature

CONTRACTOR, Printed Name

SECTION 00360 - SUBCONTRACTOR REPORT

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

END OF SECTION

SECTION 00500 - AGREEMENT

THIS AGREEMENT is between HAINES BOROUGH (hereinafter called OWNER) and _____ (hereinafter called CONTRACTOR) OWNER and CONTRACTOR, in consideration of the mutual covenants hereinafter set forth, agree as follows:

ARTICLE 1. WORK.

CONTRACTOR shall complete the WORK as specified or as indicated under the Bid Schedule of the OWNER's Bid Documents entitled **2016 Wastewater Treatment Plant Upgrade**.

The WORK is generally described as follows: The WORK consists of removing and replacing a 75' x 85' pre-engineered building, removing and replacing siding and roofing on a 20' x 42' building, improvements to the wastewater treatment plant effluent piping, furnishing and installing a new influent screening/grit removal system, along with other associated miscellaneous structural, electrical and mechanical items of work.

The WORK to be paid under this contract shall include the following: Base Bid as shown in Section 00310 - Bid Schedule.

ARTICLE 2. CONTRACT COMPLETION TIME. All WORK within these Contract Documents shall be substantially completed by September 1, 2017.

ARTICLE 3. DATE OF AGREEMENT

The date of this Agreement will be the date of the last signature on page three of this section.

ARTICLE 4. LIQUIDATED DAMAGES.

OWNER and the CONTRACTOR recognize that time is of the essence of this Agreement and that the OWNER will suffer financial loss if the WORK is not completed within the time specified in Article 2 herein, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. They also recognize the delays, expense, and difficulties involved in proving in a legal proceeding the actual damages suffered by the OWNER if the WORK is not completed on time. Accordingly, instead of requiring any such proof, the OWNER and the CONTRACTOR agree that as liquidated damages for delay (but not as a penalty) the CONTRACTOR shall pay the OWNER **\$1,000.00** for each Day that expires after the completion time specified in Article 2 herein. The amount of liquidated damages specified above is agreed to be a reasonable estimate based on all facts known as of the date of this Agreement.

ARTICLE 5. CONTRACT PRICE.

OWNER shall pay CONTRACTOR for completion of the WORK in accordance with the Contract Documents in the amount set forth in the Bid Schedule. The CONTRACTOR agrees to accept as full and complete payment for all WORK to be done in this contract for: **2016 Wastewater Treatment Plant Upgrade**, the amount as set forth in the Bid Schedule in the Contract Documents for this Project.

The total amount of this contract shall be _____ (\$ _____), except as adjusted in accordance with the provisions of the Bid Documents.

ARTICLE 6. PAYMENT PROCEDURES.

CONTRACTOR shall submit Applications for Payment in accordance with Article 14 of the General

SECTION 00500 - AGREEMENT

Conditions. Applications for Payment will be processed by the ENGINEER as provided in the General Conditions.

Progress payments will be paid in full in accordance with Article 14 of the General Conditions until ninety (90) percent of the Contract Price has been paid. The remaining ten (10) percent of the Contract Price may be retained, in accordance with applicable Alaska State Statutes, until final inspection, completion, and acceptance of the Project by the OWNER.

ARTICLE 7. CONTRACT DOCUMENTS.

The Contract Documents which comprise the entire Agreement between OWNER and CONTRACTOR concerning the WORK consist of this Agreement (pages 00500-1 to 00500-7, inclusive) and the following sections of the Contract Documents:

- Table of Contents (pages 00005-1 to 00005-2, inclusive)
- Notice Inviting Bids (pages 00030-1 to 00030-2, inclusive).
- Instructions to Bidders (pages 00100-1 to 00100-7, inclusive)
- Bid (pages 00300-1 to 00300-2, inclusive).
- Bid Schedule (pages 00310-1, inclusive).
- Bid Bond (page 00320-1, inclusive) or Bid Security.
- Subcontractor Report (pages 00360-1 to 00360-2, inclusive).
- Performance Bond (pages 00610-1 to 00610-2, inclusive).
- Payment Bond (pages 00620-1 to 00620-2, inclusive).
- Insurance Certificate(s).
- General Conditions (pages 00700-1 to 00700-47, inclusive).
- Supplementary General Conditions (pages 00800-1 to 00800-4, inclusive).
- Alaska Labor Standards, Reporting, and Prevailing Wage Determination (page 00830-1).
- Technical Specifications as listed in the Table of Contents.
- Drawings consisting of 44 sheets, as listed in the Table of Contents.
- Addenda numbers _____ to _____, inclusive.
- Change Orders which may be delivered or issued after the Date of the Agreement and which are not attached hereto.

There are no Contract Documents other than those listed in this Article 7. The Contract Documents may only be amended by Change Order as provided in Paragraph 3.3 of the General Conditions.

ARTICLE 9. MISCELLANEOUS.

Terms used in this Agreement which are defined in Article 1 of the General Conditions will have the meanings indicated in the General Conditions.

No assignment by a party hereto of any rights under or interests in the Contract Documents will be binding on another party hereto without the written consent of the party sought to be bound; and specifically but without limitation monies that may become due and monies that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

OWNER and CONTRACTOR each binds itself, its partners, successors, assigns and legal representatives to

SECTION 00500 - AGREEMENT

the other party hereto, its partners, successors, assigns and legal representatives in respect of all covenants, agreements and obligations contained in the Contract Documents. This Agreement shall be governed by the laws of the State of Alaska. Jurisdiction shall be in the State of Alaska, First Judicial District.

IN WITNESS WHEREOF, OWNER and CONTRACTOR have caused this Agreement to be executed on the date listed below by OWNER.

OWNER:

CONTRACTOR:

_____ Haines Borough _____

_____ (Company Name) _____

_____ (Signature) _____

_____ (Signature) _____

By: _____ (Printed Name)

By: _____ (Printed Name, Authority or Title)

Date: _____

CONTRACTOR Signature Date: _____

OWNER's address for giving notices:

CONTRACTOR's address for giving notices:

_____ Haines Borough _____

_____ PO Box 1209 _____

_____ Haines, Alaska 99827 _____

_____ (Telephone) (Fax) _____

907-766-2231 907-766-2713

(Telephone) (Fax)

_____ (E-mail address) _____

Contractor License No. _____

SECTION 00500 - AGREEMENT

CERTIFICATE
(if Corporation)

STATE OF)
) SS:
COUNTY OF)

I HEREBY CERTIFY that a meeting of the Board of Directors of the
_____ a corporation existing under the laws of
the State of _____, held on _____, 20____, the following resolution
was duly passed and adopted:

“RESOLVED, that _____, as _____ President
of the Corporation, be and is hereby authorized to **execute the Agreement** with the HAINES
BOROUGH and this corporation and that the execution thereof, attested by the Secretary of the
Corporation, and with the Corporate Seal affixed, shall be the official act and deed of this
Corporation.”

I further certify that said resolution is now in full force and effect.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the official seal of the
corporation this _____ day of _____, 20_____.

Secretary

(SEAL)

SECTION 00500 - AGREEMENT

CERTIFICATE
(if Partnership)

STATE OF)
) SS:
COUNTY OF)

I HEREBY CERTIFY that a meeting of the Partners of the _____ a partnership existing under the laws of the State of _____, held on _____, 20____, the following resolution was duly passed and adopted:

"RESOLVED, that _____, as _____ of the Partnership, be and is hereby authorized to **execute the Agreement** with the HAINES BOROUGH and this partnership and that the execution thereof, attested by the _____ shall be the official act and deed of this Partnership."

I further certify that said resolution is now in full force and effect.

IN WITNESS WHEREOF, I have hereunto set my hand this _____, day of _____, 20_____.

Secretary

(SEAL)

SECTION 00500 - AGREEMENT

**CERTIFICATE
(if Joint Venture)**

STATE OF)
) SS:
COUNTY OF)

I HEREBY CERTIFY that a meeting of the Principals of the
_____ a joint venture existing under the laws of the
State of _____, held on _____, 20____, the following resolution was duly passed and
adopted:

"RESOLVED, that _____, as _____ of the
Joint Venture, be and is hereby authorized to **execute the Agreement** with the HAINES
BOROUGH and this joint venture and that the execution thereof, attested by the
_____ shall be the official act and deed of this Joint Venture."

I further certify that said resolution is now in full force and effect.

IN WITNESS WHEREOF, I have hereunto set my hand this _____, day of
_____, 20____.

Secretary

(SEAL)

END OF SECTION

SECTION 00610 - PERFORMANCE BOND

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

_____ a _____
(Corporation, Partnership, Individual)

hereinafter called "Principal" and _____
(Surety)

of _____, State of _____ hereinafter called the "Surety," are held and
firmly bound to the HAINES BOROUGH of HAINES, ALASKA hereinafter called "OWNER,"
(Owner) (City and State)

for the penal sum of _____

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

THE CONDITION OF THIS OBLIGATION is such that whereas, the CONTRACTOR has entered
into a certain contract with the OWNER, the effective date of which is _____, a copy
of which is hereto attached and made a part hereof for the construction of:

2016 Wastewater Treatment Plant Upgrade

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

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

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

SECTION 00610 - PERFORMANCE BOND

2016 Wastewater Treatment Plant Upgrade

IN WITNESS WHEREOF, this instrument is issued in two (2) identical counterparts, each one of which shall be deemed an original.

CONTRACTOR:

By: _____
(Signature)

(Printed Name)

(Company Name)

(Street or P.O. Box)

(City, State, Zip Code)

SURETY:

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

Date Issued: _____

(Printed Name)

(Company Name)

(Street or P.O. Box)

(City, State, Zip Code)

(Affix SURETY'S SEAL)

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

END OF SECTION

SECTION 00620 - PAYMENT BOND

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

_____ a _____
(Corporation, Partnership, Individual)

hereinafter called "Principal" and _____
(Surety)

of _____, State of _____ hereinafter called the "Surety," are held and
firmly bound to the HAINES BOROUGH of HAINES, ALASKA hereinafter called "OWNER,"
(Owner) (City and State)

for the penal sum of _____

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

THE CONDITION OF THIS OBLIGATION is such that whereas, the CONTRACTOR has entered
into a certain contract with the OWNER, the effective date of which is _____, a copy
of which is hereto attached and made a part hereof for the construction of:

2016 Wastewater Treatment Plant Upgrade

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

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

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

SECTION 00620 - PAYMENT BOND

2016 Wastewater Treatment Plant Upgrade

IN WITNESS WHEREOF, this instrument is issued in two (2) identical counterparts, each one of which shall be deemed an original.

CONTRACTOR:

By: _____
(Signature)

(Printed Name)

(Company Name)

(Street or P.O. Box)

(City, State, Zip Code)

SURETY:

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

Date Issued: _____

(Printed Name)

(Company Name)

(Street or P.O. Box)

(City, State, Zip Code)

(Affix SURETY'S SEAL)

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

END OF SECTION

SECTION 00700 - GENERAL CONDITIONS

TABLE OF CONTENTS

ARTICLE 1 DEFINITIONS 00700-5

ARTICLE 2 PRELIMINARY MATTERS

2.1 Delivery of Bonds/Insurance Certificates 00700-9
2.2 Copies of Documents 00700-9
2.3 Commencement of Contract Time; Notice to Proceed 00700-9
2.4 Starting the WORK 00700-9
2.5 Pre-construction Conference 00700-9
2.6 Finalizing CONTRACTOR Submittals 00700-9

ARTICLE 3 CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.1 Intent 00700-10
3.2 Order of Precedence of Contract Documents 00700-10
3.3 Amending and Supplementing Contract Documents..... 00700-11
3.4 Reuse of Documents..... 00700-11

ARTICLE 4 AVAILABILITY OF LANDS; PHYSICAL CONDITIONS; REFERENCE POINTS

4.1 Availability of Lands 00700-11
4.2 Physical Conditions - Subsurface and Existing Structures 00700-11
4.3 Differing Site Conditions 00700-12
4.4 Physical Conditions - Underground Utilities 00700-12
4.5 Reference Points..... 00700-13

ARTICLE 5 BONDS AND INSURANCE

5.1 Performance, Payment and Other Bonds 00700-14
5.2 Insurance 00700-15

ARTICLE 6 CONTRACTOR'S RESPONSIBILITIES

6.1 Supervision and Superintendence..... 00700-17
6.2 Labor, Materials, and Equipment 00700-17
6.3 Adjusting Progress Schedule 00700-18
6.4 Substitutes or "Or Equal" Items..... 00700-19
6.5 Concerning Subcontractors, Suppliers and Others 00700-19
6.6 Permits..... 00700-19
6.7 Patent Fees and Royalties 00700-20
6.8 Laws and Regulations..... 00700-20

ARTICLE 6 CONTRACTOR'S RESPONSIBILITIES (Cont'd.)

SECTION 00700 - GENERAL CONDITIONS

6.9 Taxes 00700-20
6.10 Use of Premises 00700-20
6.11 Safety and Protection..... 00700-21
6.12 Shop Drawings and Samples 00700-22
6.13 Continuing the WORK..... 00700-22
6.14 Indemnification 00700-22
6.15 Contractor's Daily Reports..... 00700-23
6.16 Assignment of Contract..... 00700-23
6.17 Contractor's Responsibility for Utility Property and Services 00700-23
6.18 Operating Water System Valves 00700-24
6.19 CONTRACTOR's WORK Schedule Limitations 00700-24

ARTICLE 7 OTHER WORK

7.1 Related WORK at Site 00700-24
7.2 Coordination..... 00700-25

ARTICLE 8 OWNER'S RESPONSIBILITIES

8.1 Communications..... 00700-25
8.2 Payments 00700-25
8.3 Lands, Easements, and Surveys..... 00700-25
8.4 Change Orders..... 00700-25
8.5 Inspections and Tests..... 00700-25
8.6 Suspension of WORK 00700-25
8.7 Termination of Agreement 00700-25

ARTICLE 9 ENGINEER'S STATUS DURING CONSTRUCTION

9.1 OWNER 's Representative 00700-25
9.2 Visits to Site 00700-25
9.3 Project Representation..... 00700-26
9.4 Clarifications and Interpretations..... 00700-28
9.5 Authorized Variations in WORK 00700-28
9.6 Rejecting Defective WORK 00700-28
9.7 CONTRACTOR Submittals, Change Orders, and Payments 00700-28
9.8 Decisions on Disputes 00700-28
9.9 Limitation on Engineer's Responsibilities 00700-29

SECTION 00700 - GENERAL CONDITIONS

ARTICLE 10 CHANGES IN THE WORK

10.1	General	00700-30
10.2	Allowable Quantity Variations	00700-30

ARTICLE 11 CHANGE OF CONTRACT PRICE

11.1	General	00700-31
11.2	Costs Relating to Weather	00700-31
11.3	Cost of WORK (Based on Time and Materials)	00700-32
11.4	CONTRACTOR's Fee	00700-34
11.5	Excluded Costs	00700-35

ARTICLE 12 CHANGE OF CONTRACT TIME

12.1	General	00700-36
12.2	Extensions of Time for Delay Due to Weather	00700-36

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

13.1	Warranty and Guarantee	00700-37
13.2	Access to WORK	00700-37
13.3	Tests and Inspections	00700-37
13.4	OWNER May Stop the WORK	00700-38
13.5	Correction or Removal of Defective WORK	00700-38
13.6	One Year Correction Period	00700-39
13.7	Acceptance of Defective WORK	00700-39

ARTICLE 14 PAYMENTS TO CONTRACTOR AND COMPLETION

14.1	Schedule of Values (Lump Sum Price Breakdown)	00700-39
14.2	Unit Price Bid Schedule	00700-39
14.3	Application for Progress Payment	00700-39
14.4	CONTRACTOR's Warranty of Title	00700-40
14.5	Review of Applications for Progress Payment	00700-40
14.6	Partial Utilization	00700-41
14.7	Substantial Completion	00700-41
14.8	Final Application for Payment	00700-41
14.9	Final Payment and Acceptance	00700-42
14.10	Release of Retainage and Other Deductions	00700-42
14.11	CONTRACTOR's Continuing Obligation	00700-42
14.12	Final Payment Terminates Liability of OWNER	00700-43

SECTION 00700 - GENERAL CONDITIONS

ARTICLE 15 SUSPENSION OF WORK AND TERMINATION

15.1 Suspension of WORK by OWNER..... 00700-43
15.2 Termination of Agreement by OWNER (CONTRACTOR Default)..... 00700-43
15.3 Termination of Agreement by OWNER (For Convenience) 00700-43
15.4 Termination of Agreement by CONTRACTOR..... 00700-44

ARTICLE 16 MISCELLANEOUS

16.1 Giving Notice 00700-44
16.2 Rights In and Use of Materials Found on the WORK 00700-44
16.3 Right to Audit..... 00700-45
16.4 Archaeological or Historical Discoveries 00700-45
16.5 Construction Over or Adjacent to Navigable Waters 00700-45
16.6 Gratuity and Conflict of Interest..... 00700-45
16.7 Suits of Law Concerning the WORK 00700-46
16.8 Certified Payrolls..... 00700-46
16.9 Prevailing Wage Rates 00700-46
16.10 Employment Reference 00700-47
16.11 Cost Reduction Incentive 00700-47

SECTION 00700 - GENERAL CONDITIONS

ARTICLE 1 DEFINITIONS

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

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

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

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

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

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

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

Project Manager - The authorized representative of the Haines Borough, as OWNER, who is responsible for administration of the contract.

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

Contract Documents - The Table of Contents, Notice Inviting Bids, Instructions to Bidders, Bid Forms (including the Bid, Bid Schedule(s), Information Required of Bidder, Bid Bond, and all required certificates and affidavits), Agreement, Performance Bond, Payment Bond, General Conditions, Supplementary General Conditions, Technical Specifications, Drawings, Permits, and all Addenda, and Change Orders executed pursuant to the provisions of the Contract Documents.

Contract Price - The total monies payable by the OWNER to the CONTRACTOR under the terms and conditions of the Contract Documents.

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

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

SECTION 00700 - GENERAL CONDITIONS

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

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

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

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

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

ENGINEER - The ENGINEER is the firm or person(s) selected by the Haines Borough to perform the duties of project inspection and management. The Owner will inform the CONTRACTOR of the identity of the ENGINEER.

Field Order - A written order issued by the ENGINEER which may or may not involve a change in the WORK.

General Requirements - Division 1 of the Technical Specifications.

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

Holidays - The OWNER legal holidays occur on:

1. New Year's Day - January 1
2. President's Day - Third Monday in February
3. Memorial Day - Last Monday in May
4. Independence Day - July 4
5. Labor Day - First Monday in September
6. Alaska Day - October 18
7. Veteran's Day - November 11
8. Thanksgiving Day - Fourth Thursday and the following Friday in November
9. Christmas Eve - December 24
10. Christmas Day - December 25

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

SECTION 00700 - GENERAL CONDITIONS

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

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

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

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

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

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

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

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

OWNER - The Haines Borough, acting through its legally designated officials, officers, or employees.

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

PCB's - Polychlorinated biphenyls.

PERMITTEE – See definition for CONTRACTOR.

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

Project - The total construction of which the WORK to be provided under the Contract Documents may be the whole, or a part as indicated elsewhere in the Contract Documents.

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

SECTION 00700 - GENERAL CONDITIONS

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

Specifications - Same definition as "Technical Specifications" hereinafter.

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

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

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

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

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

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

Technical Specifications - Divisions 1 through 16 of the Contract Documents consisting of the General Requirements and written technical descriptions of products and execution of the WORK.

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

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

SECTION 00700 - GENERAL CONDITIONS

ARTICLE 2 PRELIMINARY MATTERS

- 2.1 DELIVERY OF BONDS/INSURANCE CERTIFICATES. When the CONTRACTOR delivers the signed Agreements to the OWNER, the CONTRACTOR shall also deliver to the OWNER such Bonds and Insurance Policies and Certificates as the CONTRACTOR may be required to furnish in accordance with the Contract Documents.
- 2.2 COPIES OF DOCUMENTS. The OWNER shall furnish to the CONTRACTOR the required number of copies of the Contract Documents specified in the Supplementary General Conditions.
- 2.3 COMMENCEMENT OF CONTRACT TIME; NOTICE TO PROCEED. The Contract Time will start to run on the commencement date stated in the Notice to Proceed.
- 2.4 STARTING THE WORK
- A. The CONTRACTOR shall begin to perform the WORK within 10 days after the commencement date stated in the Notice to Proceed, but no WORK shall be done at the site prior to said commencement date.
 - B. Before undertaking each part of the WORK, the CONTRACTOR shall carefully study and compare the Contract Documents and check and verify pertinent figures shown thereon and all applicable field measurements. The CONTRACTOR shall promptly report in writing to the ENGINEER any conflict, error, or discrepancy which the CONTRACTOR may discover and shall obtain a written interpretation or clarification from the ENGINEER before proceeding with any WORK affected thereby.
 - C. The CONTRACTOR shall submit to the ENGINEER for review those documents called for under Section 01300 - CONTRACTOR Submittals in the General Requirements.
- 2.5 PRE-CONSTRUCTION CONFERENCE. The CONTRACTOR is required to attend a Pre-Construction Conference. This conference will be attended by the ENGINEER and others as appropriate in order to discuss the WORK in accordance with the applicable procedures specified in the General Requirements, Section 01010 - Summary of WORK in the General Requirements.
- 2.6 FINALIZING CONTRACTOR SUBMITTALS. At least 7 days before submittal of the first Application for Payment a conference attended by the CONTRACTOR, the ENGINEER and others as appropriate will be held to finalize the initial CONTRACTOR submittals in accordance with the General Requirements. As a minimum the CONTRACTOR's representatives should include the project manager and schedule expert. The CONTRACTOR should plan on this meeting taking no less than 8 hours. If the submittals are not finalized at the end of the meeting, additional meetings will be held so that the submittals can be finalized prior to the submittal of the first application for payment. No application for payment will be processed until CONTRACTOR submittals are finalized.

SECTION 00700 - GENERAL CONDITIONS

ARTICLE 3 CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.1 INTENT

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

3.2 ORDER OF PRECEDENCE OF CONTRACT DOCUMENTS

- A. In resolving conflicts resulting from, errors, or discrepancies in any of the Contract Documents, the order of precedence shall be as follows:
 - 1. Permits from other agencies as may be required by law, excepting the definition of "PERMITEE" in these permits.
 - 2. Field Orders
 - 3. Change Orders
 - 4. ENGINEER's written interpretations and clarifications.
 - 5. Agreement
 - 6. Addenda
 - 7. CONTRACTOR's Bid (Bid Form)
 - 8. Supplementary General Conditions
 - 9. Notice Inviting Bids

SECTION 00700 - GENERAL CONDITIONS

10. Instructions to Bidders
11. General Conditions
12. Technical Specifications
13. Drawings

B. With reference to the Drawings the order of precedence is as follows:

1. Figures govern over scaled dimensions
2. Detail Drawings govern over general Drawings
3. Addenda/ Change Order drawings govern over Contract Drawings
4. Contract Drawings govern over standard drawings

3.3 AMENDING AND SUPPLEMENTING CONTRACT DOCUMENTS. The Contract Documents may be amended to provide for additions, deletions, and revisions in the WORK or to modify the terms and conditions thereof by a Change Order (pursuant to Article 10 CHANGES IN THE WORK).

3.4 REUSE OF DOCUMENTS. Neither the CONTRACTOR, nor any Subcontractor or Supplier, nor any other person or organization performing any of the WORK under a contract with the OWNER shall have or acquire any title to or ownership rights in any of the Drawings, Technical Specifications, or other documents used on the WORK, and they shall not reuse any of them on the extensions of the Project or any other project without written consent of the OWNER.

ARTICLE 4 AVAILABILITY OF LANDS; PHYSICAL CONDITIONS; REFERENCE POINTS

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

4.2 PHYSICAL CONDITIONS - SUBSURFACE AND EXISTING STRUCTURES

A. Explorations and Reports. Reference is made to SGC 4.2 Physical Conditions of the Supplementary General Conditions for identification of those reports of explorations and tests of sub-surface conditions at the site that have been utilized by the ENGINEER in the preparation of the Contract Documents. The CONTRACTOR may rely upon the accuracy of the technical data contained in such reports, however, reports are not to be considered complete or comprehensive and nontechnical data, interpretations, and opinions contained in such reports are not to be relied on by the CONTRACTOR. The CONTRACTOR is

SECTION 00700 - GENERAL CONDITIONS

responsible for any further explorations or tests that may be necessary and any interpretation, interpolation, or extrapolation that it makes of any information shown in such reports.

- B. Existing Structures. Reference is made to SGC 4.2 Physical Conditions of the Supplementary General Conditions for identification of those drawings of physical conditions in or relating to existing surface and subsurface structures (except Underground Utilities referred to in Paragraph 4.4 herein) which are at or contiguous to the site that have been utilized by the ENGINEER in the preparation of the Contract Documents. The CONTRACTOR may rely upon the accuracy of the technical data contained in such drawings, however, nontechnical data, interpretations, and opinions contained in such drawings are not to be relied on by the CONTRACTOR. The CONTRACTOR is also responsible for any interpretation, interpolation, or extrapolation that it makes of any information shown in such drawings.

4.3 DIFFERING SITE CONDITIONS

- A. The CONTRACTOR shall promptly upon discovery (but in no event later than 14 days thereafter) and before the following conditions are disturbed, notify the ENGINEER, in writing of any:
 - 1. Material that the CONTRACTOR believes may be material that is hazardous waste, as defined in Article 1 of these General Conditions, or asbestos, PCB's, petroleum or any other substance or material posing a threat to human or to the environment.
 - 2. Subsurface or latent physical conditions at the site differing from those indicated.
 - 3. Unknown physical conditions at the site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in WORK of the character provided for in the contract.
- B. The OWNER shall promptly investigate the conditions, and if it finds that the conditions do materially so differ, or do involve hazardous waste, and cause a decrease or increase in the CONTRACTOR's cost of, or the time required for, performance of any part of the WORK shall issue a Change Order under the procedures described in the contract.
- C. In the event that a dispute arises between the OWNER and the CONTRACTOR whether the conditions materially differ, or involved hazardous waste or other materials listed above, or cause a decrease or increase in the CONTRACTOR's cost of, or time required for, performance of any part of the WORK, the CONTRACTOR shall not be excused from any scheduled completion date provided for by the contract, but shall proceed with all WORK to be performed under the contract. The CONTRACTOR shall retain any and all rights provided either by contract or by Law which pertain to the resolution of disputes and protests between the contracting parties.

4.4 PHYSICAL CONDITIONS - UNDERGROUND UTILITIES

- A. Indicated. The information and data indicated in the Contract Documents with respect to existing Underground Utilities at or contiguous to the site are based on information and data furnished to the OWNER or the ENGINEER by the owners of such Underground Utilities or by others. Unless it is expressly provided in the Supplementary General Conditions and/or Section 01530 - Protection and Restoration of Existing Facilities of the General Requirements, the OWNER and the ENGINEER shall not be responsible for the accuracy or

SECTION 00700 - GENERAL CONDITIONS

completeness of any such information or data, and the CONTRACTOR shall have full responsibility for reviewing and checking all such information and data, for locating all Underground Utilities indicated in the Contract Documents, for coordination of the WORK with the owners of such Underground Utilities during construction, for the safety and protection thereof and repairing any damage thereto resulting from the WORK, the cost of which will be considered as having been included in the Contract Price.

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

4.5 REFERENCE POINTS

- A. The ENGINEER will provide one bench mark, near or on the site of the WORK, and will provide two points near or on the site to establish a base line for use by the CONTRACTOR for alignment control. Unless otherwise specified in the General Requirements, the CONTRACTOR shall furnish all other lines, grades, and bench marks required for proper execution of the WORK.
- B. The CONTRACTOR shall preserve all bench marks, stakes, and other survey marks, and in case of their removal or destruction by its own employees or by its Subcontractor's employees, the CONTRACTOR shall be responsible for the accurate replacement of such reference points by personnel qualified under the Alaska Statute governing the licensing of Architects, Engineers, and Land Surveyors.

ARTICLE 5 BONDS AND INSURANCE

5.1 PERFORMANCE, PAYMENT, AND OTHER BONDS

- A. The CONTRACTOR shall furnish, when required, Performance and Payment Bonds on forms provided by the OWNER for the penal sums of 100% of the amount of the Bid award. The surety on each bond may be any corporation or partnership authorized to do business in the State of Alaska as an insurer under AS 21.09. These bonds shall remain in effect for 12 months after the date of final payment and until all obligations and liens under this contract have been satisfied. The CONTRACTOR shall also furnish such other Bonds as are required by the Supplementary General Conditions. All Bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Audit Staff, Bureau of Government Financial Operations, U.S. Treasury Department. All Bonds signed by an agent must be accompanied by a certified copy of such agent's authority to act.

SECTION 00700 - GENERAL CONDITIONS

- B. If the surety on any Bond furnished by the CONTRACTOR is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the WORK is located, the CONTRACTOR shall within 7 days thereafter substitute another Bond and Surety, which must be acceptable to the OWNER.
- C. All Bonds required by the Contract Documents to be purchased and maintained by CONTRACTOR shall be obtained from surety companies that are duly licensed or authorized in the State of Alaska to issue Bonds for the limits so required. Such surety companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary General Conditions. The Engineer may, on behalf of the OWNER, notify the surety of any potential default or liability.

5.2 INSURANCE

- A. The CONTRACTOR shall purchase and maintain the insurance required under this paragraph. Such insurance shall include the specific coverages set out herein and be written for not less than the limits of liability and coverages provided in the Supplementary General Conditions, or required by law, whichever are greater. All insurance shall be maintained continuously during the life of the Agreement up to the date of Final Completion and at all times thereafter when the CONTRACTOR may be correcting, removing, or replacing Defective WORK in accordance with Paragraph 13.6, but the CONTRACTOR's liabilities under this Agreement shall not be deemed limited in any way to the insurance coverage required.
- B. All insurance required by the Contract Documents to be purchased and maintained by the CONTRACTOR shall be obtained from insurance companies that are duly licensed or authorized in the State of Alaska to issue insurance policies for the limits and coverages so required. Such insurance companies shall have a current Best's Rating of at least an "A" (Excellent) general policy holder's rating and a Class VII financial size category and shall also meet such additional requirements and qualifications as may be provided in the Supplementary General Conditions.
- C. The CONTRACTOR shall furnish the OWNER with certificates showing the type, amount, class of operations covered, effective dates and dates of expiration of policies. All of the policies of insurance so required to be purchased and maintained (or the certificates or other evidence thereof) shall contain a provision or endorsement that the coverage afforded will not be cancelled, reduced in coverage, or renewal refused until at least 30 days' prior written notice has been given to the OWNER by certified mail. All such insurance required herein (except for Workers' Compensation and Employer's Liability) shall name the OWNER, its Consultants and subconsultants and their officers, directors, agents, and employees as "additional insureds" under the policies. The CONTRACTOR shall purchase and maintain the following insurance:
 - 1. Workers' Compensation and Employer's Liability. This insurance shall protect the CONTRACTOR against all claims under applicable state workers' compensation laws. The CONTRACTOR shall also be protected against claims for injury, disease, or death of employees which, for any reason, may not fall within the provisions of a Workers' Compensation law. This policy shall include an "all states" endorsement. The

SECTION 00700 - GENERAL CONDITIONS

CONTRACTOR shall require each Subcontractor similarly to provide Workers' Compensation Insurance for all of the latter's employees to be engaged in such WORK unless such employees are covered by the protection afforded by the CONTRACTOR's Workers' Compensation Insurance. In case any class of employees is not protected, under the Workers' Compensation Statute, the CONTRACTOR shall provide and shall cause each Subcontractor to provide adequate employer's liability insurance for the protection of such of its employees as are not otherwise protected.

2. Commercial General Liability. This insurance shall be written in comprehensive form and shall protect the CONTRACTOR against all claims arising from injuries to persons other than its employees or damage to property of the OWNER or others arising out of any act or omission of the CONTRACTOR or its agents, employees, or Subcontractors. The policy shall contain no exclusions for any operations within the scope of this contract.
3. Comprehensive Automobile Liability. This insurance shall be written in comprehensive form and shall protect the CONTRACTOR against all claims for injuries to members of the public and damage to property of others arising from the use of motor vehicles, and shall cover operation on or off the site of all motor vehicles licensed for highway use, whether they are owned, non-owned, or hired. Coverage for hired motor vehicles should include endorsement covering liability assumed under this Agreement.
4. Subcontractor's Commercial General Liability Insurance and Commercial Automobile Liability Insurance. The CONTRACTOR shall either require each of its Subcontractors to procure and to maintain Subcontractor's Commercial General Liability and Property Damage Insurance and Vehicle Liability Insurance of the type and in the amounts specified in the Supplementary General Conditions or insure the activities of its Subcontractors in the CONTRACTOR's own policy, in like amount.
5. Builder's Risk. This insurance shall be of the "all risks" type, shall be written in completed value form, and shall protect the CONTRACTOR, the OWNER, and the ENGINEER, against risks of damage to buildings, structures, and materials and equipment. The amount of such insurance shall be not less than the insurable value of the WORK at completion. Builder's risk insurance shall provide for losses to be payable to the CONTRACTOR and the OWNER, as their interests may appear. The policy shall contain a provision that in the event of payment for any loss under the coverage provided, the insurance company shall have no rights of recovery against the CONTRACTOR, the OWNER, and the ENGINEER. The Builder's Risk policy shall insure against all risks of direct physical loss or damage to property from any external cause including flood and earthquake. Allowable exclusions, if any, shall be as specified in the Supplementary General Conditions.

ARTICLE 6 CONTRACTOR'S RESPONSIBILITIES

6.1 SUPERVISION AND SUPERINTENDENCE

- A. The CONTRACTOR shall supervise, inspect, and direct the WORK competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the WORK in accordance with the Contract Documents. The CONTRACTOR shall be solely responsible for the means, methods, techniques, sequences,

SECTION 00700 - GENERAL CONDITIONS

and procedures of construction and safety precautions and programs incidental thereto. The CONTRACTOR shall be responsible to see that the completed WORK complies accurately with the Contract Documents.

- B. The CONTRACTOR shall designate in writing and keep on the WORK site at all times during its progress a technically qualified, English-speaking superintendent, who is an employee of the CONTRACTOR and who shall not be replaced without written notice to the OWNER and the ENGINEER. The superintendent will be the CONTRACTOR's representative at the site and shall have authority to act on behalf of the CONTRACTOR. All communications given to the superintendent shall be as binding as if given to the CONTRACTOR. The CONTRACTOR shall issue all its communications to the OWNER through the ENGINEER and the ENGINEER only.
- C. The CONTRACTOR's superintendent shall be present at the site of the WORK at all times while WORK is in progress. Failure to observe this requirement shall be considered suspension of the WORK by the CONTRACTOR until such time as such superintendent is again present at the site.

6.2 LABOR, MATERIALS, AND EQUIPMENT

- A. The CONTRACTOR shall provide competent, suitably qualified personnel to survey and lay out the WORK and perform construction as required by the Contract Documents. The CONTRACTOR shall furnish, erect, maintain, and remove the construction plant and any temporary works as may be required. The CONTRACTOR shall at all times maintain good discipline and order at the site. Except in connection with the safety or protection of persons or the WORK or property at the site or adjacent thereto, and except as otherwise indicated in the Contract Documents, all WORK at the site shall be performed during regular working hours, and the CONTRACTOR will not permit overtime work or the performance of work on Saturday, Sunday, or any legal holiday without the OWNER's written consent. The CONTRACTOR shall apply for this consent through the ENGINEER.
- B. Except as otherwise provided in this Paragraph, the CONTRACTOR shall receive no additional compensation for overtime work, i.e., work in excess of 8 hours in any one calendar day or 40 hours in any one calendar week, even though such overtime work may be required under emergency conditions and may be ordered by the ENGINEER in writing. Additional compensation will be paid the CONTRACTOR for overtime work only in the event extra work is ordered by the ENGINEER and the Change Order specifically authorizes the use of overtime work and then only to such extent as overtime wages are regularly being paid by the CONTRACTOR for overtime work of a similar nature in the same locality.
- C. All costs of inspection and testing performed during overtime work by the CONTRACTOR which is allowed solely for the convenience of the CONTRACTOR shall be borne by the CONTRACTOR. The OWNER shall have the authority to deduct the cost of all such inspection and testing from any partial payments otherwise due to the CONTRACTOR.
- D. Unless otherwise specified in the Contract Documents, the CONTRACTOR shall furnish and assume full responsibility for all materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water,

SECTION 00700 - GENERAL CONDITIONS

sanitary facilities, and all other facilities and incidentals necessary for the furnishing, performance, testing, start-up, and completion of the WORK.

- E. All materials and equipment to be incorporated into the WORK shall be of good quality and new, except as otherwise provided in the Contract Documents. All warranties and guarantees specifically called for by the Specifications shall expressly run to the benefit of the OWNER. If required by the ENGINEER, the CONTRACTOR shall furnish satisfactory evidence (including reports of required tests) as to the kind and quality of materials and equipment. All materials and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned in accordance with the instructions of the applicable Supplier except as otherwise provided in the Contract Documents; but no provisions of any such instructions will be effective to assign to the ENGINEER, or any of the ENGINEER consultants, agents, or employees, any duty or authority to supervise or direct the furnishing or performance of the WORK or any duty or authority to undertake responsibility contrary to the provisions of Paragraphs 9.9C and 9.9D.
 - F. The CONTRACTOR shall at all times employ sufficient labor and equipment for prosecuting the several classes of WORK to full completion in the manner and time set forth in and required by these specifications. All workers shall have sufficient skill and experience to perform properly the WORK assigned to them. Workers engaged in special WORK, or skilled WORK, shall have sufficient experience in such WORK and in the operation of the equipment required to perform all WORK, properly and satisfactorily.
 - G. Any person employed by the CONTRACTOR or by any Subcontractor who, in the opinion of the ENGINEER, does not perform the WORK in a proper and skillful manner, or is intemperate or disorderly shall, at the written request of the ENGINEER, be removed forthwith by the CONTRACTOR or Subcontractor employing such person, and shall not be employed again in any portion of the WORK without the approval of the ENGINEER. Should the CONTRACTOR fail to remove such person or persons as required above, or fail to furnish suitable and sufficient personnel for the proper prosecution of the WORK, the ENGINEER may suspend the WORK by written notice until such orders are complied with.
- 6.3 ADJUSTING PROGRESS SCHEDULE. The CONTRACTOR shall submit monthly updates of the progress schedule to the ENGINEER for acceptance in accordance with the provisions in Section 01300 - CONTRACTOR Submittals in the General Requirements.
- 6.4 SUBSTITUTES OR "OR-EQUAL" ITEMS. The CONTRACTOR shall submit proposed substitutes or "or-equal" items in accordance with the provisions in Section 01300 - CONTRACTOR Submittals in the General Requirements.
- 6.5 CONCERNING SUBCONTRACTORS, SUPPLIERS, AND OTHERS.
- A. The CONTRACTOR shall be responsible to the OWNER and the ENGINEER for the acts and omissions of its Subcontractors and their employees to the same extent as CONTRACTOR is responsible for the acts and omissions of its own employees. Nothing contained in this Paragraph shall create any contractual relationship between any Subcontractor and the OWNER or the ENGINEER nor relieve the CONTRACTOR of any liability or obligation under the prime contract.

SECTION 00700 - GENERAL CONDITIONS

- B. The CONTRACTOR shall perform not less than 40% of the WORK with its own forces (i.e., without subcontracting). The 40% requirement shall be understood to mean that the CONTRACTOR shall perform, with its own organization, WORK amounting to at least 40% of the awarded contract amount. The 40% requirement will be calculated based upon the total of the subcontract amounts submitted for contract award, and any other information requested by the OWNER from the apparent low bidder.

6.6 PERMITS

- A. Unless otherwise provided in the Supplementary General Conditions, the CONTRACTOR shall obtain and pay for all construction permits and licenses from the agencies having jurisdiction, including the furnishing of insurance and bonds if required by such agencies. The enforcement of such requirements under this contract shall not be made the basis for claims for additional compensation. The OWNER shall assist the CONTRACTOR, when necessary, in obtaining such permits and licenses. The CONTRACTOR shall pay all governmental charges and inspection fees necessary for the prosecution of the WORK, which are applicable at the time of opening of Bids. The CONTRACTOR shall pay all charges of utility owners for connections to the WORK.
- B. These Contract Documents may require that the WORK be performed within the conditions and/or requirements of local, state and/or federal permits. These permits may be bound within the Contract Documents, included within the Contract Documents by reference, or included as part of the WORK, as designated in this Section. The CONTRACTOR is responsible for completing the WORK required for compliance with all permit requirements; this WORK is incidental to other items in the Contract Documents. Any reference to the PERMITTEE in the permits shall mean the CONTRACTOR. If any permits were acquired by the OWNER, this action was done to expedite the start of construction. If the CONTRACTOR does not complete the WORK within the specified permit window, the CONTRACTOR shall be responsible for the permit extension, and for completing any additional requirements placed upon the permit.

- 6.7 PATENT FEES AND ROYALTIES. The CONTRACTOR shall pay all license fees and royalties and assume all costs incident to the use in the performance of the WORK or the incorporation in the WORK of any invention, design, process, product, software or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the WORK and if to the actual knowledge of the OWNER or the ENGINEER its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by the OWNER in the Contract Documents. The CONTRACTOR shall indemnify, defend and hold harmless the OWNER and the ENGINEER and anyone directly or indirectly employed by either of them from and against all claims, damages, losses, and expenses (including attorneys' fees and court costs) arising out of any infringement of patent rights or copyrights incident to the use in the performance of the WORK or resulting from the incorporation in the WORK of any invention, design, process, product, or device not specified in the Contract Documents, and shall defend all such claims in connection with any alleged infringement of such rights.

- 6.8 LAWS AND REGULATIONS. The CONTRACTOR shall observe and comply with all federal, state, and local laws, ordinances, codes, orders, and regulations which in any manner affect those engaged or employed on the WORK, the materials used in the WORK, or the conduct of the WORK. If any

SECTION 00700 - GENERAL CONDITIONS

discrepancy or inconsistency should be discovered in this contract in relation to any such law, ordinance, code, order, or regulation, the CONTRACTOR shall report the same in writing to the ENGINEER. The CONTRACTOR shall indemnify, defend, and hold harmless the OWNER, the ENGINEER, and their officers, agents, and employees against all claims or liability arising from violation of any such law, ordinance, code, order, or regulation, whether by CONTRACTOR or by its employees, Subcontractors, or third parties. Any particular law or regulation specified or referred to elsewhere in the Contract Documents shall not in any way limit the obligation of the CONTRACTOR to comply with all other provisions of federal, state, and local laws and regulations.

The OWNER may, per AS 36.30, audit the CONTRACTOR's or Subcontractor(s) records that are related to the cost or pricing data for this contract, all related Change Orders, and/or contract modifications.

- 6.9 TAXES. The CONTRACTOR shall pay all sales, consumer, use, and other similar taxes required to be paid by the CONTRACTOR in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the WORK.
- 6.10 USE OF PREMISES. The CONTRACTOR shall confine construction equipment, the storage of materials and equipment, and the operations of workers to (1) the Project site, (2) the land and areas identified in and permitted by the Contract Documents, and (3) the other land and areas permitted by Laws and Regulations, rights-of-way, permits, leases and easements. The CONTRACTOR shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof or of any land or areas contiguous thereto, resulting from the performance of the WORK. Should any claim be made against the OWNER or the ENGINEER by any such owner or occupant because of the performance of the WORK, the CONTRACTOR shall promptly attempt to settle with such other party by agreement or otherwise resolve the claim through litigation. The CONTRACTOR shall, to the fullest extent permitted by Laws and Regulations, indemnify, defend, and hold the OWNER and the ENGINEER harmless from and against all claims, damages, losses, and expenses (including, but not limited to, fees of engineers attorneys, and other professionals and court costs) arising directly, indirectly, or consequentially out of any action, legal or equitable, brought by any such owner or occupant against the OWNER, the ENGINEER, their Consultants, Sub-consultants, and the officers, directors, employees and agents of each and any of them to the extent caused by or based upon the CONTRACTOR's performance of the WORK.
- 6.11 SAFETY AND PROTECTION
- A. The CONTRACTOR shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the WORK. The CONTRACTOR shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:
1. all employees on the WORK and other persons and organizations who may be affected thereby;
 2. all the WORK and materials and equipment to be incorporated therein, whether in storage on or off the site; and
 3. other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

SECTION 00700 - GENERAL CONDITIONS

- B. The CONTRACTOR shall comply with all applicable Laws and Regulations whether referred to herein or not) of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury, or loss and shall erect and maintain all necessary safeguards for such safety and protection. The CONTRACTOR shall notify owners of adjacent property and utilities when prosecution of the WORK may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.
- C. The CONTRACTOR shall designate a qualified and experienced safety representative at the site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and program.
- D. Materials that contain hazardous substances or mixtures may be required on the WORK. A Material Safety Data Sheet shall be requested by the CONTRACTOR from the manufacturer of any hazardous product used.
- E. Material usage shall be accomplished with strict adherence to all safety requirements and all manufacturer's warnings and application instructions listed on the Material Safety Data Sheet and on the product container label.
- F. The CONTRACTOR shall be responsible for coordinating communications on any exchange of Material Safety Data Sheets or other hazardous material information that is required to be made available to, or exchanged between, or among, employers at the site in accordance with Laws or Regulations.
- G. The CONTRACTOR shall notify the ENGINEER if it considers a specified product or its intended usage to be unsafe. This notification must be given to the ENGINEER prior to the product being ordered, or if provided by some other party, prior to the product being incorporated in the WORK.

SECTION 00700 - GENERAL CONDITIONS

6.12 SHOP DRAWINGS AND SAMPLES

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

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

6.14 INDEMNIFICATION

- A. To the fullest extent permitted by Laws and Regulations, the CONTRACTOR shall indemnify, defend, and hold harmless the OWNER, the ENGINEER, their Consultants, Sub-consultants and the officers, directors, employees, and agents of each and any of them, against and from all claims and liability arising under, by reason of or incidentally to the contract or any performance of the WORK, but not from the sole negligence or willful misconduct of the OWNER, and the ENGINEER. Such indemnification by the CONTRACTOR shall include but not be limited to the following:
 - 1. Liability or claims resulting directly or indirectly from the negligence or carelessness of the CONTRACTOR, its employees, or agents in the performance of the WORK, or in guarding or maintaining the same, or from any improper materials, implements, or appliances used in its construction, or by or on account of any act or omission of the CONTRACTOR, its employees, agents, or third parties;
 - 2. Liability or claims arising directly or indirectly from bodily injury, occupational sickness or disease, or death of the CONTRACTOR's or Subcontractor's own employees engaged in the WORK resulting in actions brought by or on behalf of such employees against the OWNER, and the ENGINEER;
 - 3. Liability or claims arising directly or indirectly from or based on the violation of any law, ordinance, regulation, order, or decree, whether by the CONTRACTOR, its employees, or agents;
 - 4. Liability or claims arising directly or indirectly from the use or manufacture by the CONTRACTOR, its employees, or agents in the performance of this contract of any copyrighted or non-copyrighted composition, secret process, patented or non-patented invention, computer software, article, or appliance, unless otherwise specifically stipulated in this contract.

SECTION 00700 - GENERAL CONDITIONS

5. Liability or claims arising directly or indirectly from the breach of any warranties, whether express or implied, made to the OWNER or any other parties by the CONTRACTOR, its employees, or agents;
 6. Liabilities or claims arising directly or indirectly from the willful or criminal misconduct of the CONTRACTOR, its employees, or agents; and,
 7. Liabilities or claims arising directly or indirectly from any breach of the obligations assumed herein by the CONTRACTOR.
- B. The CONTRACTOR shall reimburse the ENGINEER and the OWNER for all costs and expenses, (including but not limited to fees and charges of engineers, attorneys, and other professionals and court costs including all costs of appeals) incurred by said OWNER, and the ENGINEER in enforcing the provisions of this Paragraph 6.14.
- C. The indemnification obligation under this Paragraph 6.14 shall not be limited in any way by any limitation of the amount or type of damages, compensation, or benefits payable by or for the CONTRACTOR or any such Subcontractor or other person or organization under workers' compensation acts, disability benefit acts, or other employee benefit acts.
- 6.15 **CONTRACTOR'S DAILY REPORTS.** The CONTRACTOR shall complete a daily report indicating total manpower for each construction trade, major equipment on site, each Subcontractor's manpower, weather conditions, etc., involved in the performance of the WORK. The daily report shall be completed on forms provided by the ENGINEER and shall be submitted to the ENGINEER at the conclusion of each workday. The report should comment on the daily progress and status of the WORK within each major component of the WORK. These components will be decided by the ENGINEER. CONTRACTOR shall record the name, affiliation, time of arrival and departure, and reason for visit for all visitors to the location of the WORK.
- 6.16 **ASSIGNMENT OF CONTRACT.** The CONTRACTOR shall not assign, sublet, sell, transfer, or otherwise dispose of the contract or any portion thereof, or its right, title, or interest therein, or obligations thereunder, without the written consent of the OWNER except as imposed by law. If the CONTRACTOR violates this provision, the contract may be terminated at the option of the OWNER. In such event, the OWNER shall be relieved of all liability and obligations to the CONTRACTOR and to its assignee or transferee, growing out of such termination.
- 6.17 **CONTRACTOR'S RESPONSIBILITY FOR UTILITY PROPERTY AND SERVICES.** It is understood that any turn-on or turn-off, line locates and any other work or assistance necessary by the OWNER's Water Utilities Division, will be at the CONTRACTOR's expense unless otherwise stated in the bid documents. All cost must be agreed to prior to any related actions, and will be considered incidental to the project cost. Billing to the CONTRACTOR will be direct from the OWNER's Water Utilities Division.
- 6.18 **OPERATING WATER SYSTEM VALVES**
- A. The CONTRACTOR shall submit a written request, to the ENGINEER, for approval to operate any valve on any in-service section of the OWNER's water system. The request must be submitted at least 24-hours prior to operating any valves. The OWNER's Water Utilities Division reserves the right to approve or deny the request. The request shall specifically identify each valve to be operated, the time of operation, and the operation to be performed.

SECTION 00700 - GENERAL CONDITIONS

The CONTRACTOR shall obtain the written approval of the ENGINEER for any scheduled operation before operating any valve.

- B. The CONTRACTOR shall be responsible for all damages, both direct and consequential, to the OWNER or any other party, caused by unauthorized operation of any valve of the OWNER's water system.

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

ARTICLE 7 OTHER WORK

7.1 RELATED WORK AT SITE

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

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

SECTION 00700 - GENERAL CONDITIONS

responsibility will be itemized and the extent of such authority and responsibilities will be provided in the Supplementary General Conditions.

ARTICLE 8 OWNER'S RESPONSIBILITIES

8.1 COMMUNICATIONS

- A. The OWNER shall issue all its communications to the CONTRACTOR through the ENGINEER.
- B. The CONTRACTOR shall issue all its communications to the OWNER through the ENGINEER.

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

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

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

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

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

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

ARTICLE 9 ENGINEER'S STATUS DURING CONSTRUCTION

9.1 OWNER'S REPRESENTATIVE. The ENGINEER will be the OWNER's representative during the construction period. The duties and responsibilities and the limitations of authority of the ENGINEER as the OWNER's representative during construction are set forth in the Contract Documents.

9.2 VISITS TO SITE. The ENGINEER will make visits to the site during construction to observe the progress and quality of the WORK and to determine, in general, if the WORK is proceeding in accordance with the Contract Documents. Exhaustive or continuous on-site inspections to check the quality or quantity of the WORK will not be required of the ENGINEER. The ENGINEER will not, during such visits, or as a result of such observations of the CONTRACTOR's WORK in progress, supervise, direct, or have control over the CONTRACTOR's WORK.

9.3 PROJECT REPRESENTATION. The ENGINEER may furnish an Inspector to assist in observing the performance of the WORK. The duties, responsibilities, and limitations of authority are as follows:

- A. Duties, Responsibilities and Limitations of Authority of Inspector

SECTION 00700 - GENERAL CONDITIONS

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

Duties and Responsibilities. The Inspector may:

1. Review the progress schedule, list of Shop Drawing submittals and schedule of values prepared by the CONTRACTOR and consult with the ENGINEER concerning their acceptability.
2. Attend pre-construction conferences. Arrange a schedule of progress meetings and other job conferences as required in consultation with the ENGINEER and notify those expected to attend in advance. Attend meetings and maintain and circulate copies of minutes thereof.
3. Serve as the ENGINEER's liaison with the CONTRACTOR, working principally through the CONTRACTOR's superintendent and assist said superintendent in understanding the intent of the Contract Documents. Assist the ENGINEER in serving as the OWNER's liaison with the CONTRACTOR when the CONTRACTOR's operations affect the OWNER's on-site operations.
4. As requested by the ENGINEER, assist in obtaining from the OWNER additional details or information, when required at the site for proper execution of the WORK.
5. Receive and record date of receipt of Shop Drawings and samples, receive samples which are furnished at the site by the CONTRACTOR and notify the ENGINEER of their availability for examination.
6. Conduct on-site observations of the WORK in progress to assist the ENGINEER in determining if the WORK is proceeding in accordance with the Contract Documents.
7. Report to the ENGINEER whenever the Inspector believes that any WORK is unsatisfactory, faulty, or defective or does not conform to the Contract Documents, or does not meet the requirements of any inspection, tests or approval required to be made or has been damaged prior to final payment; and advise the ENGINEER when the Inspector believes WORK should be corrected or rejected or should be uncovered for observation, or requires special testing, inspection, or approval.
8. Verify that the tests, equipment, and systems startups and operating and maintenance instruction are conducted as required by the Contract Documents and in presence of the required personnel, and that the CONTRACTOR maintains adequate records thereof; observe, record and report to the ENGINEER appropriate details relative to the test procedures and start-ups.
9. Accompany visiting inspectors representing public or other agencies having jurisdiction over the WORK, record the outcome of these inspections, and report to the ENGINEER.
10. Transmit to the CONTRACTOR the ENGINEER's clarifications and interpretations of the Contract Documents.
11. Consider and evaluate the CONTRACTOR's suggestions for modifications in the Contract Documents and report them with recommendations to the ENGINEER.
12. Maintain at the job site orderly files for correspondence, reports of job conferences, Shop Drawings and sample submittals, reproductions of original Contract Documents including all addenda, Change Orders, field orders, additional Drawings issued

SECTION 00700 - GENERAL CONDITIONS

subsequent to the execution of the contract, the ENGINEER's clarifications and interpretations of the Contract Documents, progress reports, and other related documents.

13. Keep a diary or log book, recording hours on the job site, weather conditions, data relative to questions of extras or deductions, list all project visitors, daily activities, decisions, observations in general, and specific observations in more detail as in the case of performing and observing test procedures. Send copies to the ENGINEER.
14. Record names, addresses, and telephone numbers of the CONTRACTOR, Subcontractors, and major suppliers of materials and equipment.
15. Furnish the ENGINEER with periodic reports as required of progress of the WORK and the CONTRACTOR's compliance with the accepted progress schedule and schedule of CONTRACTOR submittals.
16. Consult with the ENGINEER in advance of scheduled major tests, inspections, or start of important phases of the WORK.
17. Report immediately to the ENGINEER upon the occurrence of any accident.
18. Review applications for payment with the CONTRACTOR for compliance with the established procedure for their submittal and forward them with recommendations to the ENGINEER, noting particularly their relation to the schedule of values, WORK completed, and materials and equipment delivered at the site but not incorporated in the WORK.
19. During the course of the WORK, verify that certificates, maintenance and operation manuals, and other data required to be assembled and furnished by the CONTRACTOR are applicable to the items actually installed; and deliver this material to the ENGINEER for its review and forwarding to the OWNER prior to final acceptance of the WORK.
20. Before the ENGINEER prepares a Certificate of Substantial Completion/Notice of Completion, as applicable, review the CONTRACTOR's punch list items requiring completion or correction and add any items that CONTRACTOR has omitted.
21. Conduct final inspection in the company of the ENGINEER, the OWNER, and the CONTRACTOR, and prepare a final punch list of items to be completed or corrected.
22. Verify that all items on the punch list have been completed or corrected and make recommendations to the ENGINEER concerning acceptance.

Limitations of Authority. Except upon written instruction of the ENGINEER, the Inspector:

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

9.4 CLARIFICATIONS AND INTERPRETATIONS. The ENGINEER will issue with reasonable promptness such written clarifications or interpretations of the requirements of the Contract

SECTION 00700 - GENERAL CONDITIONS

Documents (in the form of Drawings or otherwise) as the ENGINEER may determine necessary, which shall be consistent with, or reasonably inferred from, the overall intent of the Contract Documents.

- 9.5 AUTHORIZED VARIATIONS IN WORK. The ENGINEER may authorize variations in the WORK from the requirements of the Contract Documents. These may be accomplished by a Field Order and will require the CONTRACTOR to perform the WORK involved in a manner that minimizes the impact to the WORK and the contract completion date. If the CONTRACTOR believes that a Field Order justifies an increase in the Contract Price or an extension of the Contract Time, the CONTRACTOR may make a claim therefor as provided in Article 11 or 12.
- 9.6 REJECTING DEFECTIVE WORK. The ENGINEER will have authority to reject WORK which the ENGINEER believes to be defective and will also have authority to require special inspection or testing of the WORK as provided in Paragraph 13.3G, whether or not the WORK is fabricated, installed, or completed.
- 9.7 CONTRACTOR SUBMITTALS, CHANGE ORDERS, AND PAYMENTS
- A. In accordance with the procedures set forth in the General Requirements, the ENGINEER will review all CONTRACTOR submittals, including Shop Drawings, samples, substitutes, or "or equal" items, etc., in order to determine if the items covered by the submittals will, after installation or incorporation in the WORK, conform to the requirements of the Contract Documents and be compatible with the design concept of the completed project as a functioning whole as indicated by the Contract Documents. The ENGINEER's review will not extend to means, methods, techniques, sequences or procedures of construction or to safety precautions or programs incident thereto.
- B. In connection with the ENGINEER's responsibilities as to Change Orders, see Articles 10, 11, and 12.
- C. In connection with the ENGINEER's responsibilities in respect of Applications for Payment, see Article 14.
- 9.8 DECISIONS ON DISPUTES
- A. The ENGINEER will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the WORK thereunder. Claims, disputes, and other matters relating to the acceptability of the WORK; the interpretation of the requirements of the Contract Documents pertaining to the performance of the WORK; and those claims under Articles 11 and 12 in respect to changes in the Contract Price or Contract Time will be referred initially to the ENGINEER in writing with a request for formal decision in accordance with this paragraph, which the ENGINEER will render in writing within 30 days of receipt of the request. Written notice of each such claim, dispute, and other matter will be delivered by the CONTRACTOR to the ENGINEER promptly (but in no event later than 30 days) after the occurrence of the event giving rise thereto. Written supporting data will be submitted to the ENGINEER within 60 days after such occurrence unless the ENGINEER allows an additional period of time to ascertain more accurate data in support of the claim.

SECTION 00700 - GENERAL CONDITIONS

- B. The rendering of a decision by the ENGINEER with respect to any such claim, dispute, or other matter (except any which have been waived by the making or acceptance of final payment as provided in Paragraph 14.12) will be a condition precedent to any exercise by the OWNER or the CONTRACTOR of such rights or remedies as either may otherwise have under the Contract Documents or by Law or Regulations in respect of any such claim, dispute, or other matter.

9.9 LIMITATION ON ENGINEER'S RESPONSIBILITIES

- A. Neither the ENGINEER's authority to act under this Article or other provisions of the Contract Documents nor any decision made by the ENGINEER in good faith either to exercise or not exercise such authority shall give rise to any duty or responsibility of the ENGINEER to the CONTRACTOR, any Subcontractor, any Supplier, any surety for any of them, or any other person or organization performing any of the WORK.
- B. Whenever in the Contract Documents the terms "as ordered," "as directed," "as required," "as allowed," "as reviewed," "as approved," or terms of like effect or import are used, or the adjectives "reasonable," "suitable," "acceptable," "proper," or "satisfactory" or adjectives of like effect or import are used to describe a requirement, direction, review, or judgment of the ENGINEER as to the WORK, it is intended that such requirement, direction, review, or judgment will be solely to evaluate the WORK for compliance with the requirements of the Contract Documents, and conformance with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents, unless there is a specific statement indicating otherwise. The use of any such term or adjective shall not be effective to assign to the ENGINEER any duty or authority to supervise or direct the performance of the WORK or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.9C or 9.9D.
- C. The ENGINEER will not supervise, direct, control, or have authority over or be responsible for the CONTRACTOR's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of the CONTRACTOR to comply with Laws and Regulations, applicable to the performance of the WORK. The ENGINEER will not be responsible for the CONTRACTOR's failure to perform the WORK in accordance with the Contract Documents.
- D. The ENGINEER will not be responsible for the acts or omissions of the CONTRACTOR nor of any Subcontractor, supplier, or any other person or organization performing any of the WORK.

ARTICLE 10 CHANGES IN THE WORK

10.1 GENERAL

- A. Without invalidating the Agreement and without notice to any surety, the OWNER may at any time or from time to time, order additions, deletions, or revisions in the WORK; these will be authorized by a written Field Order and/or a Change Order issued by the ENGINEER.

SECTION 00700 - GENERAL CONDITIONS

- B. If the CONTRACTOR believes that it is entitled to an increase or decrease in the Contract Price, or an extension or shortening in the Contract Time as the result of a Field Order, a claim may be made as provided in Articles 11 and 12.
- C. If the OWNER and CONTRACTOR agree on the value of any work, or the amount of Contract Time that should be allowed as a result of a Field Order, upon receiving written notice from the ENGINEER, the CONTRACTOR shall proceed so as to minimize the impact on and delays to the work pending the issuance of a Change Order.
- D. If the OWNER and the CONTRACTOR are unable to agree as to the extent, if any, of an increase or decrease in the Contract Price or an extension or shortening of the Contract Time that should be allowed as a result of a Field Order, the ENGINEER can direct the CONTRACTOR to proceed on the basis of Time and Materials so as to minimize the impact on and delays to WORK, and a claim may be made therefor as provided in Articles 11 and 12.
- E. The CONTRACTOR shall not be entitled to an increase in the Contract Price nor an extension of the Contract Time with respect to any work performed that is not required by the Contract Documents as amended, modified, supplemented by Change Order, except in the case of an emergency and except in the case of uncovering work as provided in Paragraph 13.3G.
- F. The OWNER and the CONTRACTOR shall execute appropriate Change Orders covering:
 - 1. changes in the WORK which are ordered by the OWNER pursuant to Paragraph 10.1A;
 - 2. changes required because of acceptance of Defective WORK under Paragraph 13.7;
 - 3. changes in the Contract Price or Contract Time which are agreed to by the parties; or
 - 4. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by the ENGINEER pursuant to Paragraph 9.8.
- G. If notice of any change is required by the provisions of any Bond to be given to a surety, the giving of any such notice will be the CONTRACTOR's responsibility, and the amount of each applicable Bond shall be adjusted accordingly.

10.2 ALLOWABLE QUANTITY VARIATIONS

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

SECTION 00700 - GENERAL CONDITIONS

ARTICLE 11 CHANGE OF CONTRACT PRICE

11.1 GENERAL

- A. The Contract Price constitutes the total compensation payable to the CONTRACTOR for performing the WORK. All duties, responsibilities, and obligations assigned to or undertaken by the CONTRACTOR to complete the WORK shall be at its expense without change in the Contract Price.
- B. The Contract Price may only be changed by a Change Order. Any claim for an increase in the Contract Price shall be based on written notice delivered by the CONTRACTOR to the ENGINEER promptly (but in no event later than 7 days) after the start of the occurrence or the event giving rise to the claim and stating the general nature of the claim. Notice of the amount of the claim with supporting data shall be delivered within 14 days after such occurrence (unless the ENGINEER allows an additional period of time to ascertain more accurate data in support of the claim) and shall be accompanied by the CONTRACTOR's written statement that the amount claimed covers all known amounts (direct, indirect, and consequential) to which the CONTRACTOR is entitled as a result of said occurrence or event. All claims for adjustment in the Contract Price shall be determined by the ENGINEER in accordance with Paragraph 9.8A if the OWNER and the CONTRACTOR cannot otherwise agree on the amount involved. No claim for an adjustment in the Contract Price will be valid if not submitted in accordance with this Paragraph 11.1B.
- C. The value of any WORK covered by a Change Order or of any claim for an increase or decrease in the Contract Price shall be determined in one of the following ways:
 - 1. Where the WORK involved is covered by unit prices contained in the Contract Documents, by application of unit prices to the quantities of the items involved.
 - 2. By mutual acceptance of a lump sum, which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.4.
 - 3. On the basis of the cost of WORK (determined as provided in Paragraphs 11.3) plus a CONTRACTOR's fee for overhead and profit (determined as provided in Paragraph 11.4).

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

11.3 COST OF WORK (BASED ON TIME AND MATERIALS)

- A. General. The term "cost of work" means the sum of all costs necessarily incurred and paid by the CONTRACTOR for labor, materials, and equipment in the proper performance of extra work. Except as otherwise may be agreed to in writing by the OWNER, such costs shall be in amounts no higher than those prevailing in the locality of the Project; shall include only the

SECTION 00700 - GENERAL CONDITIONS

following items, and shall not include any of the costs itemized in Paragraph 11.5 EXCLUDED COSTS.

- B. Labor. The costs of labor will be the actual cost for wages prevailing for each craft or type of workers performing the extra work at the time the extra work is done, plus employer payments of payroll taxes, worker's compensation insurance, liability insurance, health and welfare, pension, vacation, apprenticeship funds, and other direct costs resulting from Federal, State or local laws, as well as assessments or benefits required by lawful collective bargaining agreements. Labor costs for equipment operators and helpers shall be paid only when such costs are not included in the invoice for equipment rental. The labor costs for forepersons shall be proportioned to all of their assigned work and only that applicable to extra work shall be paid. Non-direct labor costs including superintendence shall be considered part of the mark-up set out in paragraph 11.4.
- C. Materials. The cost of materials reported shall be at invoice or lowest current price at which materials are locally available and delivered to the job in the quantities involved, plus the cost of freight, delivery and storage, subject to the following:
1. Trade discounts available to the purchaser shall be credited to the OWNER notwithstanding the fact that such discounts may not have been taken by the CONTRACTOR.
 2. For materials secured by other than a direct purchase and direct billing to the purchaser, the cost shall be deemed to be the price paid to the actual supplier as determined by the ENGINEER. Mark-up except for actual costs incurred in the handling of such materials will not be allowed.
 3. Payment for materials from sources owned wholly or in part by the purchaser shall not exceed the price paid by the purchaser for similar materials from said sources on extra work items or the current wholesale price for such materials delivered to the work site, whichever price is lower.
 4. If in the opinion of the ENGINEER the cost of material is excessive, or the CONTRACTOR does not furnish satisfactory evidence of the cost of such material, then the cost shall be deemed to be the lowest current wholesale price for the quantity concerned delivered to the work site less trade discount. The OWNER reserves the right to furnish materials for the extra work and no claim shall be allowed by the CONTRACTOR for costs and profit on such materials.
- D. Equipment. The CONTRACTOR will be paid for the use of equipment at the rental rate listed for such equipment specified in the Supplementary General Conditions. Such rental rate will be used to compute payments for equipment whether the equipment is under the CONTRACTOR's control through direct ownership, leasing, renting, or another method of acquisition. The rental rate to be applied for use of each item of equipment shall be the rate resulting in the least total cost to the OWNER for the total period of use. If it is deemed necessary by the CONTRACTOR to use equipment not listed in the publication specified in the Supplementary General Conditions, an equitable rental rate for the equipment will be established by the ENGINEER. The CONTRACTOR may furnish cost data which might assist the ENGINEER in the establishment of the rental rate.
1. All equipment shall, in the opinion of the ENGINEER, be in good working condition and suitable for the purpose for which the equipment is to be used.

SECTION 00700 - GENERAL CONDITIONS

2. Before construction equipment is used on the extra work, the CONTRACTOR shall plainly stencil or stamp an identifying number thereon at a conspicuous location, and shall furnish to the ENGINEER, in duplicate, a description of the equipment and its identifying number.
 3. Unless otherwise specified, manufacturer's ratings and manufacturer approved modifications shall be used to classify equipment for the determination of applicable rental rates. Equipment which has no direct power unit shall be powered by a unit of at least the minimum rating recommended by the manufacturer.
 4. Individual pieces of equipment or tools having a replacement value of \$200 or less, whether or not consumed by use, shall be considered to be small tools and no payment will be made therefor.
 5. Rental time will not be allowed while equipment is inoperative due to breakdowns.
 6. Equipment Rental Rates. Unless otherwise agreed in writing, the CONTRACTOR will be paid for the use of equipment at the rental rate listed for such equipment specified in the current edition of the following reference publication: "Rental Rate Blue Book" as published by Dataquest (a company of the Dunn and Bradstreet Corporation), 1290 Ridder Park Drive, San Jose, CA 95131, telephone number (800) 227-8444.
- E. Equipment on the Work Site. The rental time to be paid for equipment on the work site shall be the time the equipment is in productive operation on the extra work being performed and, in addition, shall include the time required to move the equipment to the location of the extra work and return it to the original location or to another location requiring no more time than that required to return it to its original location; except, that moving time will not be paid if the equipment is used on other than the extra work, even though located at the site of the extra work. Loading and transporting costs will be allowed, in lieu of moving time, when the equipment is moved by means other than its own power, except that no payment will be made for loading and transporting costs when the equipment is used at the site of the extra work on other than the extra work. The following shall be used in computing the rental time of equipment on the work site.
1. When hourly rates are listed, any part of an hour less than 30 minutes of operation shall be considered to be 1/2-hour of operation, and any part of an hour in excess of 30 minutes will be considered one hour of operation.
 2. When daily rates are listed, any part of a day less than 4 hours operation shall be considered to be 1/2-day of operation. When owner-operated equipment is used to perform extra work to be paid for on a time and materials basis, the CONTRACTOR will be paid for the equipment and operator, as set forth in Paragraphs (3), (4), and (5), following.
 3. Payment for the equipment will be made in accordance with the provisions in Paragraph 11.3D, herein.
 4. Payment for the cost of labor and subsistence or travel allowance will be made at the rates paid by the CONTRACTOR to other workers operating similar equipment already on the work site, or in the absence of such labor, established by collective bargaining agreements for the type of worker and location of the extra work, whether or not the operator is actually covered by such an agreement. A labor surcharge will be added to the cost of labor described herein in accordance with the provisions of Paragraph 11.3B, herein, which surcharge shall constitute full compensation for payments imposed by state and federal laws and all other payments made to or on behalf of workers other than actual wages.

SECTION 00700 - GENERAL CONDITIONS

- 5. To the direct cost of equipment rental and labor, computed as provided herein, will be added the allowances for equipment rental and labor as provided in Paragraph 11.4, herein.

- F. Specialty Work. Specialty work is defined as that work characterized by extraordinary complexity, sophistication, or innovation or a combination of the foregoing attributes which are unique to the construction industry. The following shall apply in making estimates for payment for specialty work:
 - 1. Any bid item of WORK to be classified as Specialty Work shall be listed as such in the Supplementary General Conditions. Specialty work shall be performed by an entity especially skilled in the work to be performed. After validation of invoices and determination of market values by the ENGINEER, invoices for specialty work based upon the current fair market value thereof may be accepted without complete itemization of labor, material, and equipment rental costs.
 - 2. When the CONTRACTOR is required to perform work necessitating special fabrication or machining process in a fabrication or a machine shop facility away from the job site, the charges for that portion of the work performed at the off-site facility may, by agreement, be accepted as specialty work and accordingly, the invoices for the work may be accepted without detailed itemization.
 - 3. All invoices for specialty work will be adjusted by deducting all trade discounts offered or available, whether the discounts were taken or not. In lieu of the allowances for overhead and profit specified in Paragraph 11.4, herein, an allowance of 5 percent will be added to invoices for specialty work.

- G. Sureties. All work performed hereunder shall be subject to all of the provisions of the Contract Documents and the CONTRACTOR's sureties shall be bound with reference thereto as under the original Agreement. Copies of all amendments to surety bonds or supplemental surety bonds shall be submitted to the OWNER for review prior to the performance of any work hereunder.

11.4 CONTRACTOR'S FEE

- A. Extra work ordered on the basis of time and materials will be paid for at the actual necessary cost as determined by the ENGINEER, plus allowances for overhead and profit. The allowance for overhead and profit shall include full compensation for superintendence, bond and insurance premiums, taxes, field office expense, extended overhead, home office overhead, and all other items of expense or cost not included in the cost of labor, materials, or equipment provided for under Paragraph 11.3. The allowance for overhead and profit will be made in accordance with the following schedule:

Actual Overhead and Profit Allowance	
Labor.....	15 percent
Materials.....	10 percent
Equipment.....	10 percent

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

SECTION 00700 - GENERAL CONDITIONS

- B. It is understood that labor, materials, and equipment may be furnished by the CONTRACTOR or by the Subcontractor on behalf of the CONTRACTOR. When all or any part of the extra work is performed by a Subcontractor, the allowance specified herein shall be applied to the labor, materials, and equipment costs of the Subcontractor, to which the CONTRACTOR may add 5 percent of the Subcontractor's total cost for the extra work. Regardless of the number of hierarchical tiers of Subcontractors, the 5 percent increase above the Subcontractor's total cost which includes the allowances for overhead and profit specified herein may be applied one time only.

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

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

ARTICLE 12 CHANGE OF CONTRACT TIME

12.1 GENERAL

- A. The Contract Time may only be changed by a Change Order. Any claim for an extension of the Contract Time (or Milestones) shall be based on written notice delivered by the CONTRACTOR to the ENGINEER promptly (but in no event later than 30 days) after the occurrence of the event giving rise to the claim and stating the general nature of the claim. Notice of the extent of the claim with supporting data shall be delivered within 60 days after such occurrence (unless the ENGINEER allows an additional period of time to ascertain more accurate data in support of the claim) and shall be accompanied by the CONTRACTOR's written statement that the adjustment claimed is the entire adjustment to which the

SECTION 00700 - GENERAL CONDITIONS

CONTRACTOR has reason to believe it is entitled as a result of the occurrence of said event. All claims for adjustment in the Contract Time shall be determined by the ENGINEER in accordance with Paragraph 9.8 if the OWNER and the CONTRACTOR cannot otherwise agree. No claim for an adjustment in the Contract Time will be valid if not submitted in accordance with the requirements of this Paragraph 12.1A. An increase in Contract Time does not mean that the Contractor is due an increase in Contract Price. Only compensable time extensions will result in an increase in Contract Price.

- B. All time limits stated in the Contract Documents are of the essence of the Agreement.
- C. Where CONTRACTOR is prevented from completing any part of the WORK within the Contract Times (or Milestones) due to delay beyond the control of CONTRACTOR, the Contract Times (or Milestones) will be extended in an amount equal to the time lost on the critical path of the project due to such delay if a claim is made therefor as provided in paragraph 12.1. Delays beyond the control of CONTRACTOR shall include, but not be limited to, acts or neglect by OWNER, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, unprecedented weather conditions or acts of God. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of CONTRACTOR.
- D. Where CONTRACTOR is prevented from completing any part of the WORK within the Contract Times (or Milestones) due to delay beyond the control of both OWNER and CONTRACTOR, an extension of the Contract Times (or Milestones) in an amount equal to the time lost on the critical path of the project due to such delay shall be CONTRACTOR's sole and exclusive remedy for such delay. In no event shall the OWNER be liable to CONTRACTOR, any Subcontractor, any Supplier, or any other person or organization, or to any surety for or employee or agent of any of them, for damages arising out of or resulting from (i) delays caused by or within the control of CONTRACTOR, or (ii) delays beyond the control of both parties including but not limited to fires, floods, epidemics abnormal weather conditions, acts of God or acts or neglect by utility owners or other contractors performing other work as contemplated by Article 7.

12.2 EXTENSIONS OF TIME FOR DELAY DUE TO WEATHER. Contract Time may be extended by the ENGINEER because of delays in completion of the WORK due to unusually severe weather, provided that the CONTRACTOR shall, within 10 days of the beginning of any such delay, notify the ENGINEER in writing of the cause of delay and request an extension of Contract Time. The ENGINEER will ascertain the facts and the extent of the delay and extend the time for completing the work when, in the ENGINEER's judgment, the findings of fact justify such an extension. Unprecedented, abnormal, or unusually severe weather will be defined as an event, or events, with a greater than 50-year recurrence interval, as determined by the National Weather Service, or equivalent State or Federal agency

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

13.1 WARRANTY AND GUARANTEE. The CONTRACTOR warrants and guarantees to the OWNER and the ENGINEER that all work will be in accordance with the Contract Documents and will not be defective. Prompt notice of defects known to the OWNER or ENGINEER shall be given to the

SECTION 00700 - GENERAL CONDITIONS

CONTRACTOR. All defective work, whether or not in place, may be rejected, corrected, or accepted as provided in this Article 13.

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

13.3 TESTS AND INSPECTIONS

- A. The CONTRACTOR shall give the ENGINEER timely notice of readiness of the WORK for all required inspections, tests, or approvals, and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.
- B. If Laws or Regulations of any public body having jurisdiction other than the OWNER require any WORK to specifically be inspected, tested, or approved, the CONTRACTOR shall pay all costs in connection therewith. The CONTRACTOR shall also be responsible for and shall pay all costs in connection with any inspection or testing required in connection with the OWNER's or the ENGINEER's acceptance of a Supplier of materials or equipment proposed as a substitution or (or-equal) to be incorporated in the WORK, or of materials or equipment submitted for review prior to the CONTRACTOR's purchase thereof for incorporation in the WORK. The cost of all inspections, tests, and approvals in addition to the above which are required by the Contract Documents shall be paid by the OWNER (unless otherwise specified).
- C. The ENGINEER will make, or have made, such inspections and tests as the ENGINEER deems necessary to see that the WORK is being accomplished in accordance with the requirements of the Contract Documents. Unless otherwise specified in the Supplementary General Conditions, the cost of such inspection and testing will be borne by the OWNER. In the event such inspections or tests reveal non-compliance with the requirements of the Contract Documents, the CONTRACTOR shall bear the cost of corrective measures deemed necessary by the ENGINEER, as well as the cost of subsequent reinspection and retesting. Neither observations by the ENGINEER nor inspections, tests, or approvals by others shall relieve the CONTRACTOR from the CONTRACTOR's obligation to perform the WORK in accordance with the Contract Documents.
- D. All inspections, tests, or approvals other than those required by Laws or Regulations of any public body having jurisdiction shall be performed by organizations acceptable to the ENGINEER and the CONTRACTOR.
- E. If any WORK (including the work of others) that is to be inspected, tested, or approved is covered without written concurrence of the ENGINEER, it must, if requested by the ENGINEER, be uncovered for observation. Such uncovering shall be at the CONTRACTOR's expense unless the CONTRACTOR has given the ENGINEER timely notice of the CONTRACTOR's intention to perform such test or to cover the same and the ENGINEER has not acted with reasonable promptness in response to such notice.

SECTION 00700 - GENERAL CONDITIONS

- F. If any WORK is covered contrary to the written request of the ENGINEER, it must, if requested by the ENGINEER, be uncovered for the ENGINEER's observation and recovered at the CONTRACTOR's expense.
- G. If the ENGINEER considers it necessary or advisable that covered WORK be observed by the ENGINEER or inspected or tested by others, the CONTRACTOR, at the ENGINEER's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as the ENGINEER may require, that portion of the WORK in question, furnishing all necessary labor, material, and equipment. If it is found that such WORK is defective, the CONTRACTOR shall bear all direct, indirect, and consequential costs and damages of such uncovering, exposure, observation, inspection, and testing and of satisfactory reconstruction, including but not limited to fees and charges of engineers, attorneys, and other professionals. However, if such WORK is not found to be defective, the CONTRACTOR shall be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, and reconstruction; and, if the parties are unable to agree as to the amount or extent thereof, the CONTRACTOR may make a claim therefor as provided in Articles 11 and 12.
- 13.4 OWNER MAY STOP THE WORK. If the WORK is defective, or the CONTRACTOR fails to perform work in such a way that the completed WORK will conform to the Contract Documents, the OWNER may order the CONTRACTOR to stop the WORK, or any portion thereof, until the cause for such order has been eliminated; however, this right of the OWNER to stop the WORK shall not give rise to any duty on the part of the OWNER to exercise this right for the benefit of the CONTRACTOR or any other party.
- 13.5 CORRECTION OR REMOVAL OF DEFECTIVE WORK. If required by the ENGINEER, the CONTRACTOR shall promptly, either correct all defective work, whether or not fabricated, installed, or completed, or, if the WORK has been rejected by the ENGINEER, remove it from the site and replace it with non-defective work. The CONTRACTOR shall bear all direct, indirect and consequential costs and damages of such correction or removal, including but not limited to fees and charges of engineers, attorneys, and other professionals made necessary thereby.
- 13.6 ONE YEAR CORRECTION PERIOD
- A. If within one year after the date of Substantial Completion or such longer period of time as may be prescribed by Laws or Regulations or by the terms of any applicable special guarantee required by the Contract Documents or by any specific provision of the Contract Documents, any work is found to be defective, the CONTRACTOR shall promptly, without cost to the OWNER and in accordance with OWNER's written notification, (i) correct such Defective WORK, or, if it has been rejected by the OWNER, remove it from the site and replace it with non-defective work, and (ii) satisfactorily correct or remove and replace any damage to other work of others resulting therefrom. If the CONTRACTOR does not promptly comply with such notification, or in an emergency where delay would cause serious risk of loss or damage, the OWNER may have the Defective WORK corrected or the rejected WORK removed and replaced, and all direct, indirect, and consequential costs and damages of such removal and replacement including but not limited to fees and charges of engineers, attorneys and other professionals will be paid by the CONTRACTOR.

SECTION 00700 - GENERAL CONDITIONS

- B. Where Defective WORK (and damage to other WORK resulting therefrom) has been corrected, removed or replaced under this paragraph 13.6, the correction period hereunder with respect to such WORK will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

13.7 ACCEPTANCE OF DEFECTIVE WORK. If, instead of requiring correction or removal and replacement of defective work, the OWNER prefers to accept the WORK, the OWNER may do so. The CONTRACTOR shall bear all direct, indirect, and consequential costs attributable to the OWNER's evaluation of and determination to accept such defective work. If any such acceptance occurs prior to final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the WORK, and the OWNER shall be entitled to an appropriate decrease in the Contract Price.

ARTICLE 14 PAYMENTS TO CONTRACTOR AND COMPLETION

14.1 SCHEDULE OF VALUES (LUMP SUM PRICE BREAKDOWN). The schedule of values or lump sum price breakdown established as provided in the General Requirements shall serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to the ENGINEER.

14.2 UNIT PRICE BID SCHEDULE. Progress payments on account of Unit Price work will be based on the number of units completed.

14.3 APPLICATION FOR PROGRESS PAYMENT

- A. Unless otherwise prescribed by law, on the 25th of each month, the CONTRACTOR shall submit to the ENGINEER for review, an Application for Payment filled out and signed by the CONTRACTOR covering the WORK completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents.
- B. The Application for Payment shall identify, as a sub-total, the amount of the CONTRACTOR'S Total Earnings to Date, plus the Value of Materials Stored at the Site which have not yet been incorporated in the WORK, and less a deductive adjustment for materials installed which were not previously incorporated in the WORK, but for which payment was allowed under the provisions for payment for Materials Stored at the Site, but not yet incorporated in the WORK.
- C. The Net Payment Due the CONTRACTOR shall be the above-mentioned subtotal from which shall be deducted the total amount of all previous payments made to the CONTRACTOR. Progress payments will be paid in full in accordance with Article 14 of the General Conditions until 90% of the Contract Price has been paid. The remaining 10% of the Contract Price amount may be withheld until:
 - 1. final inspection has been made;
 - 2. completion of the Project; and
 - 3. acceptance of the Project by the OWNER.
- D. The Value of Materials Stored at the Site shall be an amount equal to the specified percent of the value of such materials as set forth in the Supplementary General Conditions. Said

SECTION 00700 - GENERAL CONDITIONS

amount shall be based upon the value of all acceptable materials and equipment not incorporated in the WORK but delivered and suitably stored at the site or at another location agreed to in writing; provided, each such individual item has a value of more than \$5,000.00 and will become a permanent part of the WORK. The Application for Payment shall also be accompanied by an invoice (including shipping), a certification that the materials meet the applicable contract specifications, and any evidence required by the OWNER that the materials and equipment are covered by appropriate property insurance and other arrangements to protect the OWNER's interest therein, all of which will be satisfactory to the OWNER. Payment for materials will not constitute final acceptance. It shall be the CONTRACTOR's responsibility to protect the material from damage, theft, loss, or peril while in storage. Unless otherwise prescribed by law, the Value of Materials Stored at the Site shall be paid at the invoice amount up to a maximum of 85% of the Contract Price for those items.

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

14.5 REVIEW OF APPLICATIONS FOR PROGRESS PAYMENT

- A. The ENGINEER will, within 7 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to the OWNER, or return the Application to the CONTRACTOR indicating in writing the ENGINEER's reasons for refusing to recommend payment. In the later case, the CONTRACTOR may make the necessary corrections and resubmit the Application. If the ENGINEER still disagrees with a portion of the Application, it will submit the Application recommending the undisputed portion of the Application to the OWNER for payment and provide reasons for recommending non-payment of the disputed amount. Thirty days after presentation of the Application for Payment with the ENGINEER's recommendation, the amount recommended will (subject to the provisions of Paragraph 14.5B) become due and when due will be paid by the OWNER to the CONTRACTOR.
- B. The OWNER may refuse to make payment of the full amount recommended by the ENGINEER because claims have been made against the OWNER on account of the CONTRACTOR's performance of the WORK or Liens have been filed in connection with the WORK or there are other items entitling the OWNER to a credit against the amount recommended, but the OWNER must give the CONTRACTOR written notice within 7 days (with a copy to the ENGINEER) stating the reasons for such action.

14.6 PARTIAL UTILIZATION

- A. The OWNER shall have the right to utilize or place into service any item of equipment or other usable portion of the WORK prior to completion of the WORK. Whenever the OWNER plans to exercise said right, the CONTRACTOR will be notified in writing by the OWNER, identifying the specific portion or portions of the WORK to be so utilized or otherwise placed into service.

SECTION 00700 - GENERAL CONDITIONS

- B. It shall be understood by the CONTRACTOR that until such written notification is issued, all responsibility for care and maintenance of all of the WORK shall be borne by the CONTRACTOR. Upon issuance of said written notice of partial utilization, the OWNER will accept responsibility for the protection and maintenance of all such items or portions of the WORK described in the written notice.
- C. The CONTRACTOR shall retain full responsibility for satisfactory completion of the WORK, regardless of whether a portion thereof has been partially utilized by the OWNER and the CONTRACTOR's one year correction period shall commence only after the date of Substantial Completion for the WORK.
- 14.7 SUBSTANTIAL COMPLETION. When the CONTRACTOR considers the WORK ready for its intended use the CONTRACTOR shall notify the OWNER and the ENGINEER in writing that the WORK is substantially complete. The CONTRACTOR will attach to this request a list of all work items that remain to be completed and a request that the ENGINEER prepare a Notice of Completion. Within a reasonable time thereafter, the OWNER, the CONTRACTOR, and the ENGINEER shall make an inspection of the WORK to determine the status of completion. If the ENGINEER does not consider the WORK substantially complete, or the list of remaining work items to be comprehensive, the ENGINEER will notify the CONTRACTOR in writing giving the reasons therefor. If the ENGINEER considers the WORK substantially complete, the ENGINEER will prepare and deliver to the OWNER, for its execution and recording, the Notice of Completion signed by the ENGINEER and CONTRACTOR, which shall fix the date of Substantial Completion.
- 14.8 FINAL APPLICATION FOR PAYMENT. After the CONTRACTOR has completed all of the remaining work items referred to in Paragraph 14.7 and delivered all maintenance and operating instructions, schedules, guarantees, Bonds, certificates of inspection, record as-built documents (as provided in the General Requirements) and other documents, all as required by the Contract Documents, and after the ENGINEER has indicated that the WORK is acceptable, the CONTRACTOR may make application for final payment following the procedure for progress payments. The final Application for Payment shall be accompanied by all documentation called for in the Contract Documents, together with complete and legally effective releases or waivers (satisfactory to the OWNER) of all liens arising out of or filed in connection with the WORK.
- 14.9 FINAL PAYMENT AND ACCEPTANCE
- A. If, on the basis of the ENGINEER's observation of the WORK during construction and final inspection, and the ENGINEER's review of the final Application for Payment and accompanying documentation, all as required by the Contract Documents, the ENGINEER is satisfied that the WORK has been completed and the CONTRACTOR's other obligations under the Contract Documents have been fulfilled, the ENGINEER will, within 14 days after receipt of the final Application for Payment, indicate in writing the ENGINEER's recommendation of payment and present the Application to the OWNER for payment.
- B. After acceptance of the WORK by the OWNER's governing body, the OWNER will make final payment to the CONTRACTOR of the amount remaining after deducting all prior payments and all amounts to be kept or retained under the provisions of the Contract Documents, including the following items:
1. Liquidated damages, as applicable.

SECTION 00700 - GENERAL CONDITIONS

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

14.10 RELEASE OF RETAINAGE AND OTHER DEDUCTIONS

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

14.11 CONTRACTOR'S CONTINUING OBLIGATION. The CONTRACTOR's obligation to perform and complete the WORK in accordance with the Contract Documents shall be absolute. Neither recommendation of any progress or final payment by the ENGINEER, nor the issuance of a Notice of Completion, nor any payment by the OWNER to the CONTRACTOR under the Contract Documents, nor any use or occupancy of the WORK or any part thereof by the OWNER, nor any act of acceptance by the OWNER nor any failure to do so, nor any review of a Shop Drawing or sample submittal, will constitute an acceptance of work not in accordance with the Contract Documents or a release of the CONTRACTOR's obligation to perform the WORK in accordance with the Contract Documents.

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

ARTICLE 15 SUSPENSION OF WORK AND TERMINATION

15.1 SUSPENSION OF WORK BY OWNER. The OWNER, acting through the ENGINEER, may, at any time and without cause, suspend the WORK or any portion thereof for a period of not more than 90 days by notice in writing to the CONTRACTOR. The CONTRACTOR shall resume the WORK on receipt from the ENGINEER of a notice of resumption of work. The CONTRACTOR shall be allowed

SECTION 00700 - GENERAL CONDITIONS

an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to any suspension if the CONTRACTOR makes an approved claim therefor as provided in Articles 11 and 12.

15.2 TERMINATION OF AGREEMENT BY OWNER (CONTRACTOR DEFAULT)

- A. In the event of default by the CONTRACTOR, the OWNER may give 10 days written notice to the CONTRACTOR of OWNER's intent to terminate the Agreement and provide the CONTRACTOR an opportunity to remedy the conditions constituting the default. It shall be considered a default by the CONTRACTOR whenever CONTRACTOR shall: (1) declare bankruptcy, become insolvent, or assign its assets for the benefit of its creditors; (2) fail to provide materials or quality of work meeting the requirements of the Contract Documents; (3) disregard or violate provisions of the Contract Documents or ENGINEER's instructions; (4) fail to prosecute the WORK according to the approved progress schedule; or, (5) fail to provide a qualified superintendent, competent workers, or materials or equipment meeting the requirements of the Contract Documents. If the CONTRACTOR fails to remedy the conditions constituting default within the time allowed, the OWNER may then issue the Notice of Termination.
- B. In the event the Agreement is terminated in accordance with Paragraph 15.2A, herein, the OWNER may take possession of the WORK and may complete the WORK by whatever method or means the OWNER may select. The cost of completing the WORK shall be deducted from the balance which would have been due the CONTRACTOR had the Agreement not been terminated and the WORK completed in accordance with the Contract Documents. If such cost exceeds the balance which would have been due, the CONTRACTOR shall pay the excess amount to the OWNER. If such cost is less than the balance which would have been due, the CONTRACTOR shall not have claim to the difference.

15.3 TERMINATION OF AGREEMENT BY OWNER (FOR CONVENIENCE). The OWNER may terminate the Agreement at any time if it is found that reasons beyond the control of either the OWNER or CONTRACTOR make it impossible or against the OWNER's interests to complete the WORK. In such a case, the CONTRACTOR shall have no claims against the OWNER except: (1) for the value of work performed up to the date the Agreement is terminated; and, (2) for the cost of materials and equipment on hand, in transit, or on definite commitment, as of the date the Agreement is terminated which would be needed in the WORK and which meet the requirements of the Contract Documents. The value of work performed and the cost of materials and equipment delivered to the site, as mentioned above, shall be determined by the ENGINEER in accordance with the procedure prescribed for the making of the final application for payment and payment under Paragraphs 14.8 and 14.9.

15.4 TERMINATION OF AGREEMENT BY CONTRACTOR. The CONTRACTOR may terminate the Agreement upon 10 days written notice to the OWNER, whenever: 1) the WORK has been suspended under the provisions of Paragraph 15.1, herein, for more than 90 consecutive days through no fault or negligence of the CONTRACTOR, and notice to resume work or to terminate the Agreement has not been received from the OWNER within this time period; or, 2) the OWNER should fail to pay the CONTRACTOR any monies due him in accordance with the terms of the Contract Documents and within 60 days after presentation to the OWNER by the CONTRACTOR of a request therefor, unless within said 10-day period the OWNER shall have remedied the condition upon which the payment

SECTION 00700 - GENERAL CONDITIONS

delay was based. In the event of such termination, the CONTRACTOR shall have no claims against the OWNER except for those claims specifically enumerated in Paragraph 15.3, herein, and as determined in accordance with the requirements of said paragraph.

ARTICLE 16 MISCELLANEOUS

- 16.1 GIVING NOTICE. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or if delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.
- 16.2 RIGHTS IN AND USE OF MATERIALS FOUND ON THE WORK
- A. The CONTRACTOR may use on the Project, with ENGINEER's approval, such stone, gravel, sand, or other material determined suitable by the ENGINEER, as may be found in the excavation. The CONTRACTOR will be paid for the excavation of such material at the corresponding contract unit price. No additional payment will be made for utilizing the material from excavation as borrow, or select borrow.
 - B. The CONTRACTOR shall replace, at its own expense, with other acceptable material, all of that portion of the excavated material so removed and used which was needed for use on the project. No charge for the materials so used will be made against the CONTRACTOR except that the CONTRACTOR shall be responsible for payment of any royalties required.
 - C. The CONTRACTOR shall not excavate or remove any material from within the Project location which is not within the grading limits, as indicated by the slope and grade lines, without written authorization from the ENGINEER.
 - D. In the event the CONTRACTOR has processed materials from OWNER-furnished sources in excess of the quantities required for performance of this contract, including any waste material produced as a by-product, the OWNER may retain possession of such materials without obligation to reimburse the CONTRACTOR for the cost of their production. When such materials are in a stockpile, the ENGINEER may require: That it remain in stockpile; the CONTRACTOR level such stockpile(s); or that the CONTRACTOR remove such materials and restore the premises to a satisfactory condition at the CONTRACTOR's expense. This provision shall not preclude the OWNER from arranging with the CONTRACTOR to produce material over and above the contract needs, payment for which shall be by written agreement between the OWNER and the CONTRACTOR.
 - E. Unless otherwise provided, the material from any existing old structure may be used temporarily by the CONTRACTOR in the erection of the new structure. Such material shall not be cut or otherwise damaged except with the approval of the ENGINEER.
- 16.3 RIGHT TO AUDIT. If the CONTRACTOR submits a claim to the OWNER for additional compensation, the OWNER shall have the right, as a condition to considering the claim, and as a basis for evaluation of the claim, and until the claim has been settled, to audit the CONTRACTOR's books to the extent they are relevant. This right shall include the right to examine books, records, documents, and other evidence and accounting procedures and practices, sufficient to discover and verify all direct

SECTION 00700 - GENERAL CONDITIONS

and indirect costs of whatever nature claimed to have been incurred or anticipated to be incurred and for which the claim has been submitted. The right to audit shall include the right to inspect the CONTRACTOR's plants, or such parts thereof, as may be or have been engaged in the performance of the WORK. The CONTRACTOR further agrees that the right to audit encompasses all subcontracts and is binding upon Subcontractors. The rights to examine and inspect herein provided for shall be exercisable through such representatives as the OWNER deems desirable during the CONTRACTOR's normal business hours at the office of the CONTRACTOR. The CONTRACTOR shall make available to the OWNER for auditing, all relevant accounting records and documents, and other financial data, and upon request, shall submit true copies of requested records to the OWNER.

- 16.4 ARCHEOLOGICAL OR HISTORICAL DISCOVERIES. When the CONTRACTOR's operation encounters prehistoric artifacts, burials, remains of dwelling sites, paleontological remains, such as shell heaps, land or sea mammal bones or tusks, or other items of historical significance, the CONTRACTOR shall cease operations immediately and notify the ENGINEER. No artifacts or specimens shall be further disturbed or removed from the ground and no further operations shall be performed at the site until so directed. Should the ENGINEER order suspension of the CONTRACTOR's operations in order to protect an archaeological or historical finding, or order the CONTRACTOR to perform extra work, such order(s) shall be covered by an appropriate contract change document.
- 16.5 CONSTRUCTION OVER OR ADJACENT TO NAVIGABLE WATERS. All work over, on, or adjacent to navigable waters shall be so conducted that free navigation of the waterways will not be interfered with and the existing navigable depths will not be impaired, except as allowed by permit issued the U.S. Coast Guard and/or the U.S. Army Corps of Engineers, as applicable.
- 16.6 GRATUITY AND CONFLICT OF INTEREST. The CONTRACTOR agrees to not extend any loan, gratuity or gift of money of any form whatsoever to any employee or elected official of the OWNER, nor will the CONTRACTOR rent or purchase any equipment or materials from any employee or elected official of the OWNER, or to the best of the CONTRACTOR's knowledge, from any agent of any employee or elected official of the OWNER. Before final payment, the CONTRACTOR shall execute and furnish the OWNER an affidavit certifying that the CONTRACTOR has complied with the above provisions of the contract.
- 16.7 SUITS OF LAW CONCERNING THE WORK
- A. Should a suit of law be entered into, either by the CONTRACTOR (or the CONTRACTOR's surety) against the OWNER, or by the OWNER against the CONTRACTOR (or the CONTRACTOR's surety), the suit of law shall be tried in the First Judicial District of Alaska.
 - B. If one of the questions at issue is the satisfactory performance of the work by the CONTRACTOR and should the appropriate court of law judge the work of the CONTRACTOR to be unsatisfactory, then the CONTRACTOR (or the CONTRACTOR's surety) shall reimburse the OWNER for all legal and all other expenses (as may be allowed and set by the court) incurred by the OWNER because of the suit of the law and, further, it is agreed that the OWNER may deduct such expense from any sum or sums then, or any that become due the CONTRACTOR under the contract.

SECTION 00700 - GENERAL CONDITIONS

16.8 CERTIFIED PAYROLLS

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

16.9 PREVAILING WAGE RATES

- A. Wage rates for Laborers and Mechanics on Public Contracts, AS 36.05.070. The CONTRACTOR, or Subcontractors, shall pay all employees unconditionally and not less than once a week. Wages may not be less than those stated in Paragraph 16.8C, regardless of the contractual relationship between the CONTRACTOR or Subcontractors and laborers, mechanics, or field surveyors. The scale of wages to be paid shall be posted by the CONTRACTOR in a prominent, easily accessible place at the site of the WORK.
- B. Failure to Pay Agreed Wages, AS 36.05.080. If it is found that a laborer, mechanic, or field surveyor employed by the CONTRACTOR or Subcontractor has been, or is being, paid a rate or wages less than the established rate, the OWNER may, by written notice, terminate the CONTRACTOR or Subcontractors right to proceed with the work. The OWNER may prosecute the work to completion by contract or otherwise, and the CONTRACTOR and sureties will be held liable to the OWNER for excess costs for completing the WORK. (Section 2 ch 52 SLA 1959).
- C. Listing Contractor's Who Violate Contracts, AS 36.05.090. In addition, a list giving the names of persons who have disregarded the rights of their employees shall be distributed to all departments of State government and all political subdivisions. No person appearing on this list, and no firm, corporation, partnership or association in which the person has an interest, may work as a CONTRACTOR or Subcontractor on a public construction contract for the State, or a political subdivision of the state, until three years after the date of publication of the list. (Section 3 ch 52 SLA 1959; am Section 9 ch 142 SLA).

16.10 EMPLOYMENT REFERENCE. Workers employed in the execution of the contract by the CONTRACTOR or by any Subcontractor under this contract shall not be required or permitted to labor more than 8 hours a day or 40 hours per week in violation of the provisions of the Alaska Wage and Hour Act, Section 23.10.060.

16.11 COST REDUCTION INCENTIVE

- A. At any time within 45 days after the date of the Notice of Award, the CONTRACTOR may submit to the ENGINEER in writing, proposals for modifying the plans, specifications, or

SECTION 00700 - GENERAL CONDITIONS

other requirements of this contract for the sole purpose of reducing the total cost of construction. The cost reduction proposal shall not impair in any manner the essential functions or characteristics of the project, including but not limited to, service life, economy of operation, ease of maintenance, desired appearance or design and safety standards.

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

SECTION 00700 - GENERAL CONDITIONS

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

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

END OF SECTION

SECTION 00800 - SUPPLEMENTARY GENERAL CONDITIONS

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

SGC 1 DEFINITIONS. *Remove* the definition for Contract Documents and *replace* with the following:

Contract Documents – The Table of Contents, Notice Inviting Bids, Instructions to Bidders, Bid Forms (including the Bid, Bid Schedule(s), Subcontractor Report, Bid Bond, and all required certificates and affidavits), Agreement, Performance Bond, Payment Bond, General Conditions, Supplementary General Conditions, Alaska Labor Standards, Reporting, and Prevailing Wage Rate Determination, Special Provisions, Standard Specifications, Technical Specifications, Drawings, Permits, and all Addenda, and Change Orders executed pursuant to the provisions of the Contract Documents.

SGC 2.2 COPIES OF DOCUMENTS. *Add* the following:

The OWNER shall furnish to the CONTRACTOR up to five (5) copies of the Contract Documents which may include bound reduced Drawings, if any. Additional quantities of the Contract Documents will be furnished at reproduction cost.

SGC 4.2 PHYSICAL CONDITIONS - SUBSURFACE AND EXISTING STRUCTURES. *Add* the following:

- C. In the preparation of the Contract Documents, the Engineer of Record has relied upon:
 - 1. Field measurements and visual inspection of the existing structures and surface conditions.

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

- A. Workers' Compensation: (under Paragraph 5.2C.1 of the General Conditions) as in accordance with AS 23.30.045:
 - 1. State: Statutory
 - 2. Applicable Federal (e.g., Longshore): Statutory

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

- 3. Employers Liability
 - Bodily Injury by Accident: \$100,000.00 Each Accident
 - Bodily Injury by Disease: \$100,000.00 Each Employee
 - Bodily Injury by Disease: \$500,000.00 Policy Limit

- a. CONTRACTOR agrees to waive all rights of subrogation against the OWNER for

SECTION 00800 - SUPPLEMENTARY GENERAL CONDITIONS

WORK performed under contract.

- b. If CONTRACTOR directly utilizes labor outside of the State of Alaska in the prosecution of the WORK, "Other States" endorsement shall be required as a condition of the contract.

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

1.	General Policy	\$1,000,000.00	Each Occurrence
		\$2,000,000.00	Annual Aggregate
2.	Products/Completed Operations	\$1,000,000.00	Each Occurrence
		\$2,000,000.00	Annual Aggregate
3.	Personal Injury	\$1,000,000.00	Each Occurrence

C. Commercial Automobile Liability: (under Paragraph 5.2C.3 of the General Conditions) including Owned, Hired, and Non-Owned Vehicles:

Combined Single Limit, Bodily Injury and Property Damage \$1,000,000.00

D. Builder's Risk: Builders risk does not apply to this project.

E. Policies shall also specify insurance provided by CONTRACTOR will be considered primary and not contributory to any other insurance available to the OWNER.

F. All policies will provide for 30 Days written notice prior to any cancellation or nonrenewal of insurance policies required under contract. "Will endeavor" and "but failure to mail such notice shall impose no obligation or liability of any kind upon the Company, its agents or representatives" wording will be deleted from certificates.

G. The Haines Borough shall be named as an "Additional Insured" under all liability coverages listed in this Section, except for workers' compensation insurance.

SGC 6.20 ANTIDISCRIMINATION CLAUSE

The contractor shall not discriminate on the basis of race, color, national origin or sex in the performance of this contract. The contractor shall carry out applicable requirements of 40 CFR part 33 in the award and administration of contracts awarded under EPA financial assistance agreements. Failure by the contractor to carry out these requirements is a material breach of this contract which may result in the termination of this contract or other legally available remedies.

SGC 14.3 APPLICATION FOR PROGRESS PAYMENT. Paragraph D.

D. The Value of Materials Stored at the site shall be an amount equal to 85%.

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

B. Prior to the final payment the CONTRACTOR shall contact the Alaska Department of Labor (ADOL) and provide the OWNER with clearance from the ADOL for the CONTRACTOR and all

SECTION 00800 - SUPPLEMENTARY GENERAL CONDITIONS

Subcontractors that have worked on the Project. This clearance shall indicate that all Employment Security Taxes have been paid. A sample letter for this purpose is at the end of this section.

SGC 16.8 CERTIFIED PAYROLLS. *Change* paragraph A. to read:

- A. All CONTRACTORS or Subcontractors who perform work on a public construction contract for the OWNER shall file a certified payroll with Alaska Department of Labor. See Section 00830 - Alaska Labor Standards, Reporting, and Prevailing Wage Rate Determination. Copies of the certified payroll shall be sent to:

Borough Clerk
Haines Borough Project Manager
P.O. Box 1209
Haines, Alaska 99827

Add the following SGC 17:

SGC 17 GENERAL INFORMATION. This Project is currently funded by a grant from the State of Alaska (Alaska Department of Environmental Conservation).

SECTION 00800 - SUPPLEMENTARY GENERAL CONDITIONS

Employment Security Tax Clearance

To: Alaska Department of Labor
Juneau Field Tax Office
Phone: 907-465-2787
Fax: 907-465-2374

From: _____

Subject: **2016 WASTEWATER TREATMENT PLANT UPGRADE**

Timeframe of Contract _____

Please advise whether or not clearance is granted for the following CONTRACTOR or Subcontractor:

Name Address

Per AS 23.20.265 of the Alaska Employment Security Act, this request is for tax liability clearance and release to make final payment for WORK performed under the subject contract. Please send your response to:

Brad Ryan, Haines Borough Project Manager
Haines Borough
103 Third Avenue South
Haines, Alaska 99827

- () Tax Clearance is granted.
- () Tax Clearance is NOT granted.

Remarks: _____

Signature Date

Title

END OF SECTION

**SECTION 00830 - ALASKA LABOR STANDARDS, REPORTING, AND
PREVAILING WAGE RATE DETERMINATION**

State of Alaska, Department of Labor, Laborers' and Mechanics' Minimum Rates of Pay, AS 36.05.010 and AS 36.05.050, Wage and Hour Administration Pamphlet No. 600 Effective September 1, 2016 Issue 33 is made a part of this specification section and this contract by reference.

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

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

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

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

Borough Clerk
Haines Borough
103 Third Avenue South
Haines, AK 99827
(907) 766-2231

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

Borough Clerk
Haines Borough
103 Third Avenue South
Haines, AK 99827
(907) 766-2231

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

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

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

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

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

END OF SECTION

SECTION 01010 - SUMMARY OF WORK

PART 1 - GENERAL

1.1 GENERAL

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

1.2 WORK COVERED BY CONTRACT DOCUMENTS

- A. The WORK consists of removing and replacing a 75' x 85' pre-engineered building, removing and replacing siding and roofing on a 20' x 42' building, improvements to the wastewater treatment plant effluent piping, furnishing and installing a new influent screening/grit removal system, along with other associated miscellaneous structural, electrical and mechanical items of work.

- B. The site of the majority of WORK is at located in Haines, Alaska.

- C. OWNER:
Haines Borough
P.O. Box 1209
Haines, Alaska 99827

Engineer:
Carson Dorn Inc.
712 West 12th Street
Juneau, AK 99801
(907) 586-4447 Attn: Jim Dorn

1.3 CONTRACT METHOD

- A. The WORK, hereunder will be constructed under a unit price contract.

1.4 WORK BY OTHERS

- A. The CONTRACTOR's attention is directed to the fact that work may be conducted at the site by other contractors during the performance of the WORK under this Contract. The CONTRACTOR shall conduct its operations so as to cause a minimum of interference with the WORK of such other contractors, and shall cooperate fully with such contractors to provide continued safe access to their respective portions of the site, as required to perform work under their respective contracts.

SECTION 01010 - SUMMARY OF WORK

- B. Interference With Work On Utilities. The CONTRACTOR shall cooperate fully with all utility forces of the OWNER or private agencies engaged in the relocation, altering, or otherwise rearranging of any facilities which interfere with the progress of the WORK, and shall schedule the WORK so as to minimize interference with said relocation, altering, or other rearranging of facilities.

1.5 CONTRACTOR USE OF PROJECT SITE

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

1.6 OWNER USE OF THE PROJECT SITE

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01025 - MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.1 SCOPE

- A. Payment for the various items of the Bid Schedule, as further specified herein, shall include all compensation to be received by the Contractor for furnishing all tools, equipment, supplies, and manufactured articles, and for all labor, operations, and incidentals appurtenant to the items for WORK being described, as necessary to complete the various items of the WORK all in accordance with the requirements of the Contract Documents, including all appurtenances thereto, and including all costs of permits and cost of compliance with the regulations of public agencies having jurisdiction, including Safety and Health Requirements of Occupational Safety and Health Administration of the U.S. Department of Labor (OSHA) and Occupational Safety and Health Standards of the Alaska Department of Labor, Division of Labor Standards and Safety.
- B. No separate payment will be made for any item that is not specifically set forth in the Bid Schedule, and all costs therefore shall be included in the prices named in the Bid Schedule for the various appurtenant items of WORK.
- C. In addition to the other incidental items of WORK listed elsewhere in the Contract, the following items shall also be considered as incidental to other Items of WORK under this Contract:
 - 1. Maintenance of all services through the project area including power, water, storm and sanitary sewers, garbage pickup, bus service and emergency vehicles.

1.2 MOBILIZATION (Bid Item 1505.1) PRICE BASED ON LUMP SUM

- A. Measurement for payment for Mobilization will be based upon the completion of the entire WORK as a Lump Sum unit, complete, all in accordance with the requirements of the Contract Documents.
- B. Payment for Mobilization will be made at the amount shown on the Bid Schedule under Item 1505.1, which payment will constitute full compensation for all WORK described in the Contract Documents, as shown on the Plans.
- C. Partial Payments will be made as the WORK progresses as follows:
 - 1. When 5% of the total original Contract amount is earned from other bid items, 50% of the amount bid for Mobilization, or 5% of the original Contract amount, whichever is lesser, will be paid.
 - 2. When 10% of the total original Contract amount is earned from other bid items, 100% of the amount bid for Mobilization, or 10% of the original Contract amount, whichever is lesser, will be paid.
 - 3. Upon completion of all WORK on the project, payment of any amount bid for Mobilization in excess of 10% of the original Contract amount will be paid.

1.3 EROSION CONTROL PLAN AND SWPPP (Pay Item No. 01570.1) PRICE BASED ON LUMP SUM

- A. Measurement for payment for Erosion Control Plan and SWPPP will be based upon the completion of

SECTION 01025 - MEASUREMENT AND PAYMENT

the entire WORK as Lump Sum Pay Unit, complete, including preparation and approval of the Erosion Control Plan and SWPPP all in accordance with the requirements of the Contract Documents.

- B. Payment for Erosion Control Plan and SWPPP will be made at the amount named in the Bid Schedule under Pay Item No. 01570.1, which payment will constitute full compensation for all WORK described in Section 01570- Erosion Control, as shown on the Drawings and as directed by the ENGINEER.

- 1.4 FINAL CLEAN UP AND SITE RESTORATION (Bid Item 1704.1) PRICE BASED ON LUMP SUM
 - A. Measurement for payment for Final Clean Up and Site Restoration will be based upon the completion of the entire WORK as a lump sum unit, complete, all in accordance with the requirements of the Contract Documents.

 - B. Payment for Final Clean Up and Site Restoration will be made at the amount shown on the Bid Schedule under Item 1704.1, which payment will constitute full compensation for all WORK described in SECTION 01704 – FINAL CLEAN UP SITE RESTORATION, as shown on the plans,.

- 2.1 REMOVE AND DISPOSE, EXISTING SOLIDS BUILDING SIDING ON NORTH WALL (Bid Item 2050.1) PRICE BASED ON LUMP SUM
 - A. Measurement for payment for Remove and Dispose, Existing Solids Building Siding on North Wall will be based upon the completion of the entire WORK as a lump sum unit, complete, all in accordance with the requirements of the Contract Documents.

 - B. Payment for Remove and Dispose, Existing Solids Building Siding on North Wall will be made at the amount shown on the Bid Schedule under Item 2050.1, which payment will constitute full compensation for all WORK described in SECTION 2050 – DEMOLITION, as shown on the plans, and as directed by the ENGINEER.

- 2.2 REMOVE AND DISPOSE, EXISTING TREATMENT BUILDING (Bid Item 2050.2) PRICE BASED ON LUMP SUM
 - A. Measurement for payment for Remove and Dispose, Existing Treatment Building will be based upon the completion of the entire WORK as a lump sum unit, complete, all in accordance with the requirements of the Contract Documents.

 - B. Payment for Remove and Dispose, Existing Treatment Building will be made at the amount shown on the Bid Schedule under Item 2050.2, which payment will constitute full compensation for all WORK described in SECTION 2050 – DEMOLITION, as shown on the plans, and as directed by the ENGINEER.

- 2.3 REMOVE AND DISPOSE, COVERED WALKWAY (Bid Item 2050.3) PRICE BASED ON LUMP SUM
 - A. Measurement for payment for Remove and Dispose, Covered Walkway will be based upon the completion of the entire WORK as a lump sum unit, complete, all in accordance with the requirements of the Contract Documents.

SECTION 01025 - MEASUREMENT AND PAYMENT

- B. Payment for Remove and Dispose, Covered Walkway will be made at the amount shown on the Bid Schedule under Item 2050.3, which payment will constitute full compensation for all WORK described in SECTION 2050 – DEMOLITION, as shown on the plans, and as directed by the ENGINEER.

- 2.4 REMOVE AND DISPOSE, EXISTING GRIT REMOVAL SYSTEM AND SPLITTER BOX (Bid Item 2050.4) PRICE BASED ON LUMP SUM
 - A. Measurement for payment for Remove and Dispose, Existing Grit Removal System and Splitter Box will be based upon the completion of the entire WORK as a lump sum unit, complete, all in accordance with the requirements of the Contract Documents.
 - B. Payment for Remove and Dispose, Existing Grit Removal System and Splitter Box will be made at the amount shown on the Bid Schedule under Item 2050.4, which payment will constitute full compensation for all WORK described in SECTION 2050 – DEMOLITION, as shown on the plans, and as directed by the ENGINEER.

- 2.5 REMOVE AND DISPOSE, EXISTING SOLIDS BUILDING SIDING ON EAST, WEST AND SOUTH WALLS AND SOLIDS BUILDING ROOFING (Bid Item 2050.5) PRICE BASED ON LUMP SUM
 - A. Measurement for payment for Remove and Dispose, Existing Solids Building Siding on East, West and South Walls and Solids Building Roofing will be based upon the completion of the entire WORK as a lump sum unit, complete, all in accordance with the requirements of the Contract Documents.
 - B. Payment for Remove and Dispose, Existing Solids Building Siding on East, West and South Walls and Solids Building Roofing will be made at the amount shown on the Bid Schedule under Item 2050.5, which payment will constitute full compensation for all WORK described in SECTION 2050 – DEMOLITION, as shown on the plans, and as directed by the ENGINEER.

- 2.6 CLEARING AND GRUBBING (Bid Item 2201.1) PRICE BASED ON LUMP SUM
 - A. Measurement for payment for Clearing and Grubbing will be based upon the completion of the entire WORK as a lump sum unit, complete, all in accordance with the requirements of the Contract Documents.
 - B. Payment for Clearing and Grubbing will be made at the amount shown on the Bid Schedule under Item 2201.1, which payment will constitute full compensation for all WORK described in SECTION 02201 - CLEARING AND GRUBBING, and as shown on the plans.

- 2.7 SHEETING, SHORING AND BRACING (Bid Item 2203.1) PRICE BASED ON LUMP SUM
 - A. Measurement for payment for Sheeting, Shoring and Bracing will be based upon the completion of the entire WORK as a lump sum unit, complete, all in accordance with the requirements of the Contract Documents.
 - B. Payment for sheeting, shoring, and bracing or equivalent method will be made at the lump sum price named in the Bid Schedule(s) under Item No. 2203.1, which price shall constitute full compensation for completion of all planning, design, engineering fees, furnishing and constructing, and removal and disposal of such sheeting, shoring, and bracing as a lump sum item, complete, as required under the

SECTION 01025 - MEASUREMENT AND PAYMENT

provisions of any permits, and in accordance with the latest safety requirements of State of Alaska and Federal OSHA.

- 2.8 15" SDR 35 PVC SEWER PIPE (Bid Item 2401.1) PRICE BASED ON QUANTITY, LINEAR FOOT
- A. Measurement of 15" SDR 35 PVC Sewer Pipe Sewer Pipe will be measured along the slope of the pipe per linear foot, center to center of manhole, from center of manholes to end of pipe, or to limits of payment as shown on the Drawings. The aggregate laid lengths of wyes will not be deducted from the lengths of pipe so measured.
 - B. Cleaning and testing sewer pipe will not be measured for payment but will be considered incidental to other WORK under Section 02401 – SANITARY SEWER PIPE.
 - C. Trenching, bedding and backfill will not be measured for payment, but will be considered incidental to other WORK.
 - E. Connection to existing maholes, including drop connections, will not be measured for payment but will be considered incidental to other WORK.
 - F. Payment for 15" SDR 35 PVC Sewer Pipe Sewer Pipe, will be made at the Unit Price named in the Bid Schedule under Pay Item No. 2401.1, which payment will constitute full compensation for all WORK described in Section 02401 – SANITARY SEWER PIPE , as shown on the plans and as directed by the ENGINEER.
- 2.9 16" SDR 17 HDPE SEWER EFFLUENT LINE (Bid Item 2401.2) PRICE BASED ON LUMP SUM
- A. Measurement for payment for 16" SDR 17 HDPE Sewer Effluent Line will be based upon the completion of the entire WORK as a lump sum unit, complete, all in accordance with the requirements of the Contract Documents.
 - C. All Work from the connection to the exiting clarifier to the new sanitary sewer manhole is incidental to this pay item and will not be measured for payment.
 - D. Trench excavation, bedding and backfill will not be measured for payment, but will be considered incidental to this pay item.
 - B. Payment for 16" SDR 17 HDPE Sewer Effluent Line will be made at the amount shown on the Bid Schedule under Item 2401.2, which payment will constitute full compensation for all WORK described in SECTION 02401 – SANITARY SEWER PIPE, and as shown on the plans.
- 2.10 16" SDR 17 HDPE SEWER EFFLUENT LINE (Bid Item 2401.2) PRICE BASED ON LUMP SUM
- A. Measurement for payment for 16" SDR 17 HDPE Sewer Effluent Line will be based upon the completion of the entire WORK as a lump sum unit, complete, all in accordance with the requirements of the Contract Documents.
 - C. All Work from the connection to the exiting clarifier to the new sanitary sewer manhole is incidental

SECTION 01025 - MEASUREMENT AND PAYMENT

to this pay item and will not be measured for payment.

- D. Trench excavation, bedding and backfill will not be measured for payment, but will be considered incidental to this pay item.
 - B. Payment for 16" SDR 17 HDPE Sewer Effluent Line will be made at the amount shown on the Bid Schedule under Item 2401.2, which payment will constitute full compensation for all WORK described in SECTION 02401 – SANITARY SEWER PIPE, and as shown on the plans.
- 2.11 SEWER MANHOLE (Pay Item No. 2402.1) PRICE BASED ON QUANTITY, EACH
- A. Sewer Manhole will be measured per each, complete in place, including all excavation, bedding, backfill, imported backfill, sheeting and bracing, dewatering, cleaning and testing, and all other work necessary for a complete installation.
 - B. Payment for Sewer Manhole, will be made at the Unit Price named in the Bid Schedule under Pay Item No. 2402.1, which payment will constitute full compensation for all WORK described in Section 02402 – MANHOLES AND CLEANOUTS, as shown on the plans and as directed by the ENGINEER.
- 2.12 CONSTRUCTION SURVEYING (Bid Item 2702.1) PRICE BASED ON LUMP SUM
- A. Measurement for payment for Construction Surveying will be based upon completion of the entire WORK as a Lump Sum Unit, complete all in accordance with the requirements of the Contract Documents.
 - B. Payment for Construction Surveying will be made at the Unit Price named in the Bid Schedule under Item 2702.1, which payment will constitute full compensation for all WORK describe by SECTION 2702 CONSTRUCTION SURVEYING, as shown on the Plans.
- 11.1 MAGNETIC FLOW METER (Bid Items 11120.1) PRICE BASED ON LUMP SUM
- A. Measurement for payment for Magnetic Flow Meter will be based upon completion of the entire WORK as a Lump Sum Unit, complete all in accordance with the requirements of the Contract Documents.
 - B. Magnetic Flow Meter shall include, but is not limited to, all WORK required to furnish, install and test all, fittings, equipment, instruments, piping support, and piping for the Magnetic Flow Meter and all work necessary for a complete and acceptable installation.
 - C. Payment for Magnetic Flow Meter will be made at the Lump Sum Price named in the Bid Schedule under Item 11120.1, which payment will constitute full compensation for all WORK describe by Division 11 EQUIPMENT, as shown on the Plans and as required in the Contract Documents.
- 11.2 2' PVC WASHDOWN PIPING AND APPURTENANCES (Bid Items 11120.2) PRICE BASED ON LUMP SUM
- A. Measurement for payment for 2" PVC Washdown Piping and Appurtenances will be based upon completion of the entire WORK as a Lump Sum Unit, complete all in accordance with the requirements of the Contract Documents.

SECTION 01025 - MEASUREMENT AND PAYMENT

- B. 2" PVC Washdown Piping and Appurtenances shall include, but is not limited to, all WORK required to furnish, install and test all, fittings, valves, hose bibbs and hose bibb piping, equipment, instruments, piping support, and piping for the 2" PVC Washdown Piping and Appurtenances and all work necessary for a complete and acceptable installation.
 - C. Payment for 2" PVC Washdown Piping and Appurtenances will be made at the Lump Sum Price named in the Bid Schedule under Item 11120.2, which payment will constitute full compensation for all WORK describe by Division 11 EQUIPMENT, as shown on the Plans and as required in the Contract Documents.
- 11.3 REMOVE AND REPLACE EXISTING BLOWER (Bid Items 11120.3) PRICE BASED ON LUMP SUM
- A. Measurement for payment for Remove and Replace Existing Blower will be based upon completion of the entire WORK as a Lump Sum Unit, complete all in accordance with the requirements of the Contract Documents.
 - B. Remove and Replace Existing Blower shall include, but is not limited to, all WORK required to furnish, install and test all, fittings, valves, equipment, instruments, piping support, and piping for the Remove and Replace Existing Blower and all work necessary for a complete and acceptable installation.
 - C. Payment for Remove and Replace Existing Blower will be made at the Lump Sum Price named in the Bid Schedule under Item 11120.3, which payment will constitute full compensation for all WORK describe by Division 11 EQUIPMENT, as shown on the Plans and as required in the Contract Documents.
- 11.4 PIPING, FITTINGS AND VALVES FOR ADD. ALT. NO. 1 (Bid Items 11120.4) PRICE BASED ON LUMP SUM
- A. Measurement for payment for Piping, Fittings and Valves for Add. Alt. No. 1 will be based upon completion of the entire WORK as a Lump Sum Unit, complete all in accordance with the requirements of the Contract Documents.
 - B. Piping, Fittings and Valves for Add. Alt. No. 1 shall include, but is not limited to, all WORK required to furnish, install and test all, fittings, valves, equipment, instruments, piping support, and piping for the Piping, Fittings and Valves for Add. Alt. No. 1 and all work necessary for a complete and acceptable installation.
 - C. Payment for Piping, Fittings and Valves for Add. Alt. No. 1 will be made at the Lump Sum Price named in the Bid Schedule under Item 11120.4, which payment will constitute full compensation for all WORK describe by Division 11 EQUIPMENT, as shown on the Plans and as required in the Contract Documents.
- 11.5 INFLUENT SCREEN/GRIT REMOVAL SYSTEM (Bid Items 11336.1) PRICE BASED ON LUMP SUM
- A. Measurement for payment for Influent Screen/Grit Removal System will be based upon completion of

SECTION 01025 - MEASUREMENT AND PAYMENT

the entire WORK as a Lump Sum Unit, complete all in accordance with the requirements of the Contract Documents.

- B. Influent Screen/Grit Removal System shall include, but is not limited to, all WORK required to furnish, install and test all, fittings, valves, equipment, instruments, piping support, and piping for the Influent Screen/Grit Removal System consisting of two units installed in parallel and all work necessary for a complete and acceptable installation.
- C. Payment for Influent Screen/Grit Removal System will be made at the Lump Sum Price named in the Bid Schedule under Item 11336.1, which payment will constitute full compensation for all WORK describe by Division 11 EQUIPMENT, as shown on the Plans and as required in the Contract Documents.

13.1 NEW PRE-FABRICATED TREATMENT BUILDING (Bid Items 13122.1) PRICE BASED ON LUMP SUM

- A. Measurement for payment for New Pre-Fabricated Treatment Building will be based upon completion of the entire WORK as a Lump Sum Unit, complete all in accordance with the requirements of the Contract Documents.
- B. New Pre-Fabricated Treatment Building shall include, but is not limited to, all roofing, siding; miscellaneous metal work; and any other material and work necessary for a complete, working and acceptable installation.
- C. Payment for New Pre-Fabricated Treatment Building will be made at the Lump Sum Price named in the Bid Schedule under Item 13122.1, which payment will constitute full compensation for all WORK described by SECTION 13122 PRE-FABRICATED METAL BUILDINGS, as shown on the Plans.

13.2 NEW SIDING FOR NORTH WALL OF SOLIDS BUILDING (Bid Items 13122.2) PRICE BASED ON LUMP SUM

- A. Measurement for payment for New Siding for North Wall of Solids Building will be based upon completion of the entire WORK as a Lump Sum Unit, complete all in accordance with the requirements of the Contract Documents.
- B. New Siding for North Wall of Solids Building shall include, but is not limited to, all siding; miscellaneous metal work; and any other material and work necessary for a complete, working and acceptable installation of new siding on the North Wall of the Solids Building
- C. Payment for New Roofing and Siding for Solids Building will be made at the Lump Sum Price named in the Bid Schedule under Item 13122.2, which payment will constitute full compensation for all WORK described by SECTION 13122 PRE-FABRICATED METAL BUILDINGS, as shown on the Plans.

13.3 NEW SIDING FOR EAST, WEST AND SOUTH WALLS OF SOLIDS BUILDING AND NEW ROOFING FOR SOLIDS BUILDING (Bid Items 13122.3) PRICE BASED ON LUMP SUM

- A. Measurement for payment for New Siding for East, West and South Walls of Solids Building and New Roofing for Solids Building will be based upon completion of the entire WORK as a Lump Sum Unit,

SECTION 01025 - MEASUREMENT AND PAYMENT

complete all in accordance with the requirements of the Contract Documents.

- B. New Roofing and Siding for Solids Building shall include, but is not limited to, all roofing, siding; miscellaneous metal work; and any other material and work necessary for a complete, working and acceptable installation.
- C. Payment for New Siding for East, West and South Walls of Solids Building and New Roofing for Solids Building will be made at the Lump Sum Price named in the Bid Schedule under Item 13122.3, which payment will constitute full compensation for all WORK described by SECTION 13122 PRE-FABRICATED METAL BUILDINGS, as shown on the Plans.

13.4 NEW BOILER ROOM (Bid Items 13300.1) PRICE BASED ON LUMP SUM

- A. Measurement for payment for New Boiler Room will be based upon completion of the entire WORK as a Lump Sum Unit, complete all in accordance with the requirements of the Contract Documents.
- B. New Boiler Room shall include, but is not limited to, all excavation, backfill, earthwork; all reinforced concrete; all rough carpentry; installation of doors and hardware; all insulation, and FRP; all painting; all roofing; miscellaneous metal work; and any other material and work necessary for a complete, working and acceptable installation.
- C. Payment for New Boiler Room will be made at the Lump Sum Price named in the Bid Schedule under Item 13300.1, which payment will constitute full compensation for all WORK described by SECTION 13300 BUILDING GENERAL PROVISIONS, as shown on the Plans.

13.5 NEW CONTROL ROOM (Bid Items 13300.2) PRICE BASED ON LUMP SUM

- A. Measurement for payment for New Control Room will be based upon completion of the entire WORK as a Lump Sum Unit, complete all in accordance with the requirements of the Contract Documents.
- B. New Control Room shall include, but is not limited to, all all reinforced concrete; all rough carpentry; installation of doors and hardware; all insulation, and FRP; all painting; all roofing; miscellaneous metal work; and any other material and work necessary for a complete, working and acceptable installation.
- C. Payment for New Control Room will be made at the Lump Sum Price named in the Bid Schedule under Item 13300.2, which payment will constitute full compensation for all WORK described by SECTION 13300 BUILDING GENERAL PROVISIONS, as shown on the Plans.

13.6 NEW FIBERGLASS DOORS (Bid Items 13300.3) PRICE BASED ON QUANTITY, EACH

- A. Measurement for payment for New Fiberglass Doors will be measured per each, complete in place, including all door hardware, framing and all other work necessary for a complete installation.
- B. Payment for New Fiberglass Doors will be made at the Unit Price named in the Bid Schedule under Item 13300.3, which payment will constitute full compensation for all WORK described by SECTION 13300 BUILDING GENERAL PROVISIONS, and as shown on the Plans.

13.7 NEW 8'w by 10'h INSULATED OVERHEAD ROLLING DOORS (Bid Items 13300.4) PRICE BASED ON QUANTITY, EACH

SECTION 01025 - MEASUREMENT AND PAYMENT

- A. Measurement for payment for New 8'w by 10'h Overhead Rolling Doors will be measured per each, complete in place, including all door hardware and all other work necessary for a complete installation.
- B. Payment for New 8'w by 10'h Overhead Rolling Doors will be made at the Unit Price named in the Bid Schedule under Item 13300.4, which payment will constitute full compensation for all WORK described by SECTION 13300 BUILDING GENERAL PROVISIONS, and as shown on the Plans.

16.1 ELECTRICAL, BASE BID (Bid Items 16000.1) PRICE BASED ON LUMP SUM

- A. Measurement for payment for Electrical, Base Bid will be based upon completion of the entire WORK as a Lump Sum Unit, complete all in accordance with the requirements of the Contract Documents.
- B. Electrical, Base Bid shall include, but is not limited to, all electrical work, earthwork, concrete, metal fabrication, electrical controls, lighting, heating units, louvers, switches, power connections, conduit, buried conduit, pull boxes, vaults, local control panels, alarms, testing, warranties, operations and technical data as required, and any other material and work necessary for a complete, working and acceptable installation as described in the Contract Documents and as directed by the Engineer.
- C. Electrical, Base Bid does not include electrical items associated with furnishing and installing the Influent Screen/Grit Removal System (Additive Alternate No. 1).
- D. Payment for Electrical, Base Bid, will be made at the Lump Sum Price named in the Bid Schedule under Item 16000.1, which payment will constitute full compensation for all WORK describe by DIVISION 16000 ELECTRICAL, as shown on the Plans.

16.2 ELECTRICAL, NEW INFLUENT SCREENS/GRIT REMOVAL SYSTEM (Bid Items 16000.2) PRICE BASED ON LUMP SUM

- A. Measurement for payment for Electrical, New Influent Screens/Grit Removal System will be based upon completion of the entire WORK as a Lump Sum Unit, complete all in accordance with the requirements of the Contract Documents.
- B. Electrical, New Influent Screens/Grit Removal System shall include, but is not limited to, all electrical work, earthwork, concrete, metal fabrication, electrical controls, lighting, heating units, louvers, switches, power connections, conduit, buried conduit, pull boxes, vaults, local control panels, alarms, testing, warranties, operations and technical data as required, and any other material and work necessary for a complete, working and acceptable installation as described in the Contract Documents and as directed by the Engineer for electrical work associated with Additive Alternate No. 1.
- C. Payment for Electrical, New Influent Screens/Grit Removal System, will be made at the Lump Sum Price named in the Bid Schedule under Item 16000.2, which payment will constitute full compensation for all WORK describe by DIVISION 16000 ELECTRICAL, as shown on the Plans.

23.1 NEW HEATING SYSTEM (Bid Items 23000.1) PRICE BASED ON LUMP SUM

- A. Measurement for payment for New Heating System will be based upon completion of the entire WORK as a Lump Sum Unit, complete all in accordance with the requirements of the Contract Documents.

SECTION 01025 - MEASUREMENT AND PAYMENT

- B. Payment for New Heating System will be made at the Unit Price named in the Bid Schedule under Item 23000.1, which payment will constitute full compensation for all WORK described by SECTION 23 HEATING, and as shown on the Plans.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01070 - ABBREVIATIONS OF INSTITUTIONS

PART 1 - GENERAL

1.1 GENERAL

- A. Wherever in these Specifications references are made to the standards, specifications, or other published data of the various international, national, regional, or local organizations, such organizations may be referred to by their acronym or abbreviation only. As a guide to the user of these Specifications, the following acronyms or abbreviations which may appear in these Specifications shall have the meanings indicated herein.

1.2 ABBREVIATIONS

AAMA	Architectural Aluminum Manufacturer's Association
AAR	Association of American Railroads
AASHTO	American Association of State Highway and Transportation Officials
AATCC	American Association of Textile Chemists and Colorists
ACI	American Concrete Institute
AFBMA	Anti-Friction Bearing Manufacturer's Association, Inc.
AGA	American Gas Association
AGMA	American Gear Manufacturer's Association
AHAM	Association of Home Appliance Manufacturers
AI	The Asphalt Institute
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
AMCA	Air Moving and Conditioning Association
ANS	American Nuclear Society
ANSI	American National Standards Institute, Inc.
APA	American Plywood Association
API	American Petroleum Institute
APWA	American Public Works Association
ASA	Acoustical Society of America
ASAE	American Society of Agricultural Engineers
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
ASLE	American Society of Lubricating Engineers
ASME	American Society of Mechanical Engineers
ASQC	American Society for Quality Control
ASSE	American Society of Sanitary Engineers
ASTM	American Society for Testing and Materials
ATM	Alaska Test Methods
AWPA	American Wood Preservers Association
AWPI	American Wood Preservers Institute
AWS	American Welding Society
AWWA	American Water Works Association
BBC	Basic Building Code, Building Officials and Code Administrators International
BHMA	Builders Hardware Manufacturer's Association
CBM	Certified Ballast Manufacturers
CEMA	Conveyors Equipment Manufacturer's Association

SECTION 01070 - ABBREVIATIONS OF INSTITUTIONS

CGA	Compressed Gas Association
CLFMI	Chain Link Fence Manufacturer's Institute
CMA	Concrete Masonry Association
CRSI	Concrete Reinforcing Steel Institute
DCDMA	Diamond Core Drill Manufacturer's Association
EIA	Electronic Industries Association
ETL	Electrical Test Laboratories
FPL	Forest Products Laboratory
HI	Hydronics Institute
ICBO	International Conference of Building Officials
IEEE	Institute of Electrical and Electronics Engineers
IES	Illuminating Engineering Society
IME	Institute of Makers of Explosives
IOS	International Organization for Standardization
IP	Institute of Petroleum (London)
IPC	Institute of Printed Circuits
IPCEA	Insulated Power Cable Engineers Association
ISA	Instrument Society of America
ITE	Institute of Traffic Engineers
MBMA	Metal Building Manufacturer's Association
MPTA	Mechanical Power Transmission Association
MTI	Marine Testing Institute
NAAMM	National Association of Architectural Metal Manufacturer's
NACE	National Association of Corrosion Engineers
NBS	National Bureau of Standards
NCCLS	National Committee for Clinical Laboratory Standards
NEC	National Electrical Code
NEMA	National Electrical Manufacturer's Association
NFPA	National Fire Protection Association
NFPA	National Forest Products Association
NLGI	National Lubricating Grease Institute
NMA	National Microfilm Association
NWMA	National Woodwork Manufacturers Association
OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
RIS	Redwood Inspection Service
RVIA	Recreational Vehicle Industry Association
RWMA	Resistance Welder Manufacturer's Association
SAE	Society of Automotive Engineers
SAMA	Scientific Apparatus Makers Association
SMA	Screen Manufacturers Association
SMACCNA	Sheet Metal and Air Conditioning Contractors National Association
SPIB	Southern Pine Inspection Bureau
SPR	Simplified Practice Recommendation
SSA	Swedish Standards Association
SSBC	Southern Standard Building Code, Southern Building Code Congress
SSPC	Steel Structures Painting Council
SSPWC	Standard Specifications for Public Works Construction
TAPPI	Technical Association of the Pulp and Paper Industry
TFI	The Fertilizer Institute

SECTION 01070 - ABBREVIATIONS OF INSTITUTIONS

UBC	Uniform Building Code
UL	Underwriters Laboratories, Inc.
WCLIB	West Coast Lumber Inspection Bureau
WCRSI	Western Concrete Reinforcing Steel Institute
WIC	Woodwork Institute of California
WRI	Wire Reinforcement Institute, Inc.
WWPA	Western Wood Products Association

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01090 - REFERENCE STANDARDS

PART 1 - GENERAL

1.1 GENERAL

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

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Without limiting the generality of other requirements of the Specifications, all work specified herein shall conform to or exceed the requirements of applicable codes and the applicable requirements of the following documents.
- B. References herein to "Building Code" or "Uniform Building Code" shall mean Uniform Building Code of the International Conference of Building Officials (ICBO).
- C. Similarly, references to "Mechanical Code" or "Uniform Mechanical Code," "Plumbing Code" or "Uniform Plumbing Code," "Fire Code" or "Uniform Fire Code," shall mean Uniform Mechanical Code, Uniform Plumbing Code and Uniform Fire Code of the International Conference of the Building Officials (ICBO). "Electric Code" or "National Electric Code (NEC)" shall mean the National Electric Code of the National Fire Protection Association (NFPA). The latest edition of the codes as approved by the Municipal Code and used by the local agency as of the date that the WORK is advertised for bids, as adopted by the agency having jurisdiction, shall apply to the WORK herein, including all addenda, modifications, amendments, or other lawful changes thereto.
- D. In case of conflict between codes, reference standards, Drawings and the other Contract Documents, the most stringent requirements shall govern. All conflicts shall be brought to the attention of the ENGINEER for clarification and directions prior to ordering or providing any

SECTION 01090 - REFERENCE STANDARDS

materials or furnishing labor. The CONTRACTOR shall bid for the most stringent requirements.

- E. The CONTRACTOR shall construct the WORK specified herein in accordance with the requirements of the Contract Documents and the referenced portions of those referenced codes, standards, and specifications listed herein.
- F. Applicable Standard Specifications. References in Contract Sections 02801 -ASPHALT CONCRETE PAVEMENT to Standard Specifications shall mean the Alaska Department of Transportation and Public Facilities "STANDARD SPECIFICATIONS for Highway Construction - 1988" and any supplements or amendments thereto.
- G. References herein to "OSHA Regulations for Construction" shall mean Title 29, Part 1926, Construction Safety and Health Regulations, Code of Federal Regulations (OSHA), including all changes and amendments thereto.
- H. References herein to "OSHA Standards" shall mean Title 29, Part 1910, Occupational Safety and Health Standards, Code of Federal Regulations (OSHA), including all changes and amendments thereto.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01300 - CONTRACTOR SUBMITTALS

PART 1 - GENERAL

1.1 GENERAL

- A. Wherever submittals are required hereunder, all such submittals by the CONTRACTOR shall be submitted to the ENGINEER.
- B. Within 14 days after the date of commencement as stated in the Notice to Award, the CONTRACTOR shall submit the following items to the ENGINEER for review:
 - 1. A preliminary schedule of Shop Drawing, Sample, and proposed Substitutes or “Or-Equal” submittals.
 - 2. A list of all permits and licenses the CONTRACTOR shall obtain indicating the agency required to grant the permit and the expected date of submittal for the permit and required date for receipt of the permit.
 - 3. A complete progress schedule for all phases of the project.
 - 4. All required Material Safety Data Sheets.
 - 5. A traffic maintenance plan, as required.
 - 6. A plan for temporary erosion control and pollution control, as required.
 - 7. A letter designating the CONTRACTOR's Superintendent, defining that person's responsibility and authority.
 - 8. A letter designating the CONTRACTOR's safety representative and the EEO Officer and that person's responsibility and authority.
- C. No payments shall be made to the CONTRACTOR until all these items are submitted in their entirety, as determined by the ENGINEER.
- D. CONTRACTOR shall provide submittals for items identified in the technical specifications.

1.2 SHOP DRAWING SUBMITTAL

- A. Wherever called for in the Contract Documents, or where required by the ENGINEER, the CONTRACTOR shall furnish to the ENGINEER, for review, a digital copy of each shop drawing submittal. The term "Shop Drawings" as used herein shall be understood to include detail design calculations, shop drawings, fabrication, and installation drawings, erection drawings, lists, graphs, operating instructions, catalog sheets, data sheets, and similar items.
- B. All Shop Drawing submittals shall be accompanied by the CONTRACTOR's standard submittal transmittal form. Any submittal not accompanied by such a form, or where all applicable items on the form are not completed, will be returned for re-submittal.
- C. Normally, a separate transmittal form shall be used for each specific item or class of material or equipment for which a submittal is required. Transmittal of a submittal of various items using a single transmittal form will be permitted only when the items taken together constitute a manufacturer's “package” or are so functionally related that expediency indicates review of the group or package as a whole. A multiple-page submittal shall be collated into sets, and each set shall be stapled or bound, as appropriate, prior to transmittal to the ENGINEER.
- D. Except as may otherwise be provided herein, the ENGINEER will return prints of each submittal to the CONTRACTOR with its comments noted thereon, within 30 calendar days

SECTION 01300 - CONTRACTOR SUBMITTALS

following their receipt by the ENGINEER. It is considered reasonable that the CONTRACTOR shall make a complete and acceptable submittal to the ENGINEER by the second submission of a submittal item. The OWNER reserves the right to withhold monies due the CONTRACTOR to cover additional costs of the ENGINEER review beyond the second submittal. The ENGINEER's maximum review period for each submittal including all re-submittals will be 30 days per submission. In other words, for a submittal that requires 2 re-submittals before it is complete, the maximum review period for that submittal could be 90 days.

- E. If copies of a submittal are returned to the CONTRACTOR marked "NO EXCEPTIONS TAKEN," formal revision and re-submission of said submittal will not be required.
- F. If copies of a submittal are returned to the CONTRACTOR marked "MAKE CORRECTIONS NOTED," formal revision and re-submission of said submittal will not be required.
- G. If a copy of the submittal is returned to the CONTRACTOR marked "AMEND-RESUBMIT," the CONTRACTOR shall revise said submittal and shall resubmit the required number of copies of said revised submittal to the ENGINEER.
- H. If a copy of the submittal is returned to the CONTRACTOR marked "REJECTED-RESUBMIT," the CONTRACTOR shall revise said submittal and shall resubmit the required number of copies of said revised submittal to the ENGINEER.
- I. Fabrication of an item may be commenced only after the ENGINEER has reviewed the pertinent submittal and returned copies to the CONTRACTOR marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED." Corrections indicated on submittal shall be considered as changes necessary to meet the requirements of the Contract Documents and shall not be taken as the basis for changes to the Contract requirements. Only a change order can alter the contract price, time, or requirements.
- J. All CONTRACTOR shop drawing submittals shall be carefully reviewed by an authorized representative of the CONTRACTOR, prior to submission to the ENGINEER. Each submittal shall be dated, signed, and certified by the CONTRACTOR, as being correct and in strict conformance with the Contract Documents. In the case of shop drawings, each sheet shall be so dated, signed, and certified. No consideration for review by the ENGINEER of any CONTRACTOR submittal will be made for any items which have not been so certified by the CONTRACTOR. All non-certified submittals will be returned to the CONTRACTOR without action taken by the ENGINEER, and any delays caused thereby shall be the total responsibility of the CONTRACTOR.
- K. The ENGINEER's review of CONTRACTOR shop drawing submittals shall not relieve the CONTRACTOR of the entire responsibility for the correctness of details and dimensions. The CONTRACTOR shall assume all responsibility and risk for any misfits due to any errors in CONTRACTOR submittals. The CONTRACTOR shall be responsible for the dimensions and the design of adequate connections and details.

1.3 SAMPLES SUBMITTAL

SECTION 01300 - CONTRACTOR SUBMITTALS

- A. Whenever in the Specifications samples are required, the CONTRACTOR shall submit not less than 3 samples of each such item or material to the ENGINEER for acceptance at no additional cost to the OWNER.
- B. Samples, as required herein, shall be submitted for acceptance a minimum of 21 days prior to ordering such material for delivery to the job site, and shall be submitted in an orderly sequence so that dependent materials or equipment can be assembled and reviewed without causing delays in the WORK.
- C. All samples shall be individually and indelibly labeled or tagged, indicating thereon all specified physical characteristics and Supplier's names for identification and submitted to the ENGINEER for acceptance. Upon receiving acceptance of the ENGINEER, one set of the samples will be stamped and dated by the ENGINEER and returned to the CONTRACTOR, and one set of samples will be retained by the ENGINEER, and one set of samples shall remain at the job site until completion of the WORK.
- D. Unless clearly stated otherwise, it is assumed that all colors and textures of specified items presented in sample submittal are from the manufacturer's standard colors and standard materials, products, or equipment lines. If the samples represent non-standard colors, materials, products or equipment lines, and their selection will require an increase in contract time or price, the CONTRACTOR will clearly indicate this on the transmittal page of the submittal.

1.4 RECORD DRAWINGS SUBMITTAL

- A. The CONTRACTOR shall keep and maintain, at the job site, one record set of Drawings. On these, it shall mark all project conditions, locations, configurations, and any other changes or deviations which may vary from the details represented on the original Contract Drawings, including buried or concealed construction and utility features which are revealed during the course of construction. Special attention shall be given to recording the horizontal and vertical location of all buried utilities that differ from the locations indicated, or which were not indicated on the Contract Drawings. Said record drawings shall be supplemented by any detailed sketches as necessary or directed to indicate, fully, the WORK as actually constructed. These master record drawings of the CONTRACTOR's representation of as-built conditions, including all revisions made necessary by addenda, change orders, and the like shall be maintained up-to-date during the progress of the WORK.
- B. In the case of those drawings which depict the detail requirement for equipment to be assembled and wired in the factory, such as motor control centers and the like, the record drawings shall be updated by indicating those portions which are superseded by change order drawings or final shop drawings, and by including appropriate reference information describing the change orders by number and the shop drawings by manufacturer, drawing, and revision numbers.
- C. Record drawings shall be accessible to the ENGINEER at all times during the construction period and shall be delivered to the ENGINEER on the 20th working day of every third month after the month in which the Notice to Proceed is given as well as upon completion of the WORK.

SECTION 01300 - CONTRACTOR SUBMITTALS

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

1.5 PROGRESS SCHEDULES

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

1.6 PROPOSED SUBSTITUTES OR "OR-EQUAL" ITEM SUBMITTAL

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

SECTION 01300 - CONTRACTOR SUBMITTALS

work of its subcontractors and of other contractors, and shall effect such changes without cost to the OWNER. This shall include the cost for redesign and claims of other contractor affected by the resulting change.

- B. The procedure for review by the ENGINEER will include the following:
1. If the CONTRACTOR wishes to furnish or use a substitute item of material or equipment, the CONTRACTOR shall make written application to the ENGINEER on the "Substitution Request" for acceptance thereof. The "Substitution Request Form" is located at the end of this Section.
 2. Unless otherwise provided by law or authorized in writing by the ENGINEER, the "Substitution Requests" shall be submitted within the 21-day period after Notice of Award.
 3. Wherever a proposed substitute material or equipment has not been submitted within said 21-day period, or wherever the submission of a proposed substitute material or equipment has been judged to be unacceptable by the ENGINEER, the CONTRACTOR shall provide material or equipment named in the Contract Documents.
 4. The CONTRACTOR shall certify that the proposed substitute will perform adequately the functions and achieve the results called for by the general design, be similar and of equal substance to that specified, and be suited to the same use as that specified.
 5. The ENGINEER will be allowed a reasonable time within which to evaluate each proposed substitute. In no case will this reasonable time period be less than 30 days.
 6. As applicable, no shop drawing submittals will be made for a substitute item nor will any substitute item be ordered, installed, or utilized without the ENGINEER's prior written acceptance of the CONTRACTOR's "Substitution Request" which will be evidenced by a Change Order.
 7. The ENGINEER will record the time required by the ENGINEER in evaluating substitutions proposed by the CONTRACTOR and in making changes in the Contract Documents occasioned thereby. Whether or not the ENGINEER accepts a proposed substitute, the CONTRACTOR shall reimburse the OWNER for the charges of the ENGINEER for evaluating each proposed substitute.
- C. The CONTRACTOR's application using the "Substitution Request" shall contain the following statements and/or information which shall be considered by the ENGINEER in evaluating the proposed substitution:
1. The evaluation and acceptance of the proposed substitute will not prejudice the CONTRACTOR's achievement of substantial completion on time.
 2. Whether or not acceptance of the substitute for use in the WORK will require a change in any of the Contract Documents to adopt the design to the proposed substitute.

SECTION 01300 - CONTRACTOR SUBMITTALS

3. Whether or not incorporation or use of the substitute in connection with the WORK is subject to payment of any license fee or royalty.
4. All variations of the proposed substitute for that specified will be identified.
5. Available maintenance, repair, and replacement service and its estimated cost will be indicated.
6. Itemized estimate of all costs that will result directly or indirectly from acceptance of such substitute, including cost of redesign and claims of other contractors affected by the resulting change.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

(Substitution Request Form - next page)

SUBSTITUTION REQUEST FORM

TO: _____ Project: _____ Contract No. _____

OWNER:

SPECIFIED ITEM:

Section _____ Page _____ Paragraph _____ Description _____

The undersigned requests consideration of the following:

PROPOSED SUBSTITUTION:

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

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

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

The undersigned further states that the function, appearance, and quality of the proposed substitution is the equivalent of, or is superior to, the specified item.

Submitted by Contractor:

Reviewed by Architect/Engineer: _____ Signature

_____ Accepted

_____ Accepted as Noted

_____ Not Accepted

_____ Received Too Late

Firm:

By: _____

Date: _____

Title: _____

Telephone: _____ Date: _____

END OF SECTION

SECTION 01400 - QUALITY CONTROL

PART 1 - GENERAL

1.1 DEFINITION

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

1.2 INSPECTION AT PLACE OF MANUFACTURE

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

1.3 SAMPLING AND TESTING

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

1.4 INSPECTION AND TESTING LABORATORY SERVICE

- A. Inspection and testing laboratory service shall comply with the following:
 - 1. OWNER will appoint, employ, and pay for services of an independent firm to perform inspection and testing or will perform inspection and testing itself.

SECTION 01400 - QUALITY CONTROL

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 INSTALLATION

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

END OF SECTION

SECTION 01505 – MOBILIZATION

PART 1 - GENERAL

1.1 GENERAL

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

1.2 PAYMENT FOR MOBILIZATION

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

**SECTION 01530 - PROTECTION AND RESTORATION
OF EXISTING FACILITIES**

PART 1 - GENERAL

1.1 GENERAL

- A. The CONTRACTOR shall protect all existing utilities and improvements not designated for removal and shall restore damaged or temporarily relocated utilities and improvements to a condition equal to or better than they were prior to such damage or temporary relocation, all in accordance with requirements of the Contract Documents.
- B. All utility locates shall be the responsibility of the CONTRACTOR. CALL HAINES AT 766-2200 for locates of all underground utilities within the WORK limits prior to any work.
- C. The CONTRACTOR shall verify the exact locations and depths of all utilities and the CONTRACTOR shall make exploratory excavations of all utilities that may interfere with the WORK. All such exploratory excavations shall be performed as soon as practicable after award of the contract and, in any event, a sufficient time in advance of construction to avoid possible delays to the CONTRACTOR's work. Any utility or service in conflict with the WORK will be reburied by the CONTRACTOR prior beginning the WORK to avoid damage.
- D. The number of exploratory excavations required shall be that number which is sufficient to determine the alignment and grade of the utility.

1.2 RIGHTS-OF-WAY

- A. The CONTRACTOR shall not do any work that would affect any oil, gas, sewer, or water pipeline; any telephone, cable television, telegraph, or electric transmission line; any fence; or any other structure, nor shall the CONTRACTOR enter upon the rights-of-way involved until notified by the ENGINEER that the OWNER has secured authority therefor from the proper party. After authority has been obtained, the CONTRACTOR shall give said party due notice of its intention to begin work, if required by said party, and shall remove, shore, support or otherwise protect such pipeline, transmission line, ditch, fence, or structure or replace the same. When two or more contracts are being executed at one time on the same or adjacent land in such manner that work on one contract may interfere with that on another, the OWNER shall determine the sequence and order of the WORK. When the territory of one contract is the necessary or convenient means of access for the execution of another contract, such privilege of access or any other reasonable privilege may be granted by the OWNER to the CONTRACTOR so desiring, to the extent, amount, in the manner, and at the times permitted.
- B. No such decision as to the method or time of conducting the WORK or the use of territory shall be made the basis of any claim for delay or damage, except as provided for temporary suspension of the WORK in Article 15 of the General Conditions of the Contract.

**SECTION 01530 - PROTECTION AND RESTORATION
OF EXISTING FACILITIES**

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

- A. The CONTRACTOR shall not destroy, remove, or otherwise disturb any existing survey markers or other existing street or roadway markers without proper authorization. No pavement breaking or excavation shall be started until all survey or other permanent marker points that will be disturbed by the construction operations have been properly referenced. All survey monuments, markers or points disturbed by the CONTRACTOR shall be accurately re-established, at the CONTRACTOR's expense unless provided for elsewhere in the Contract, after all street or roadway resurfacing has been completed. Re-establishment of all survey monuments shall be by a Registered Alaskan Land Surveyor.

1.4 RESTORATION OF PAVEMENT

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

1.5 EXISTING UTILITIES AND IMPROVEMENTS

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

**SECTION 01530 - PROTECTION AND RESTORATION
OF EXISTING FACILITIES**

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

- B. Utilities to be Moved. In case it shall be necessary to move the property of any public utility or franchise holder, such utility company or franchise holder will, upon request of the CONTRACTOR, be notified by the OWNER to move such property within a specified reasonable time. When utility lines that are to be removed are encountered within the area of operations, the CONTRACTOR shall notify the ENGINEER a sufficient time in advance for the necessary measures to be taken to prevent interruption of service.
- C. Where the proper completion of the WORK requires the temporary or permanent removal and/or relocation of an existing utility or other improvement which is indicated, the CONTRACTOR shall remove and, without unnecessary delay, temporarily replace or relocate such utility or improvement in a manner satisfactory to the ENGINEER and the owner of the facility. In all cases of such temporary removal or relocation, restoration to former location shall be accomplished by the CONTRACTOR in a manner that will restore or replace the utility or improvement as nearly as possible to its former locations and to as good or better condition than found prior to removal.
- D. OWNER's Right of Access. The right is reserved to the OWNER and to the owners of public utilities and franchises to enter at any time upon any public street, alley, right-of-way, or easement for the purpose of making changes in their property made necessary by the WORK of this Contract.
- E. Underground Utilities Indicated. Existing utility lines that are indicated or the locations of which are made known to the CONTRACTOR prior to excavation and that are to be retained, and all utility lines that are constructed during excavation operations shall be protected from damage during excavation and backfilling and, if damaged, shall be immediately repaired or replaced by the CONTRACTOR.
- F. Underground Utilities Not Indicated. In the event that the CONTRACTOR damages any existing utility lines that are not indicated or the locations of which are not made known to the CONTRACTOR prior to excavation, a written report thereof shall be made immediately to the ENGINEER. If directed by the ENGINEER, repairs shall be made by the CONTRACTOR under the provisions for changes and extra work contained in Articles 10, 11, and 12 of the General Conditions.
- G. All costs of locating, repairing damage not due to failure of the CONTRACTOR to exercise reasonable care, and removing or relocating such utility facilities not shown in the Contract Documents with reasonable accuracy, and for equipment on the project which was actually working on that portion of the WORK which was interrupted or idled by removal or relocation of such utility facilities, and which was necessarily idled during such work will be paid for as extra work in accordance with the provisions of Articles 10, 11, and 12 of the General Conditions.
- H. Approval of Repairs. All repairs to a damaged utility or improvement are subject to inspection and approval by an authorized representative of the utility or improvement owner before being concealed by backfill or other work.

**SECTION 01530 - PROTECTION AND RESTORATION
OF EXISTING FACILITIES**

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

1.6 TREES WITHIN STREET RIGHTS-OF-WAY AND PROJECT LIMITS

- A. General. The CONTRACTOR shall exercise all necessary precautions so as not to damage or destroy any trees or shrubs, including those lying within street rights-of-way and project limits, and shall not trim or remove any trees unless such trees have been approved for trimming or removal by the jurisdictional agency or OWNER. All existing trees and shrubs which are damaged during construction shall be trimmed or replaced by the CONTRACTOR or a certified tree company under permit from the jurisdictional agency and/or the OWNER. Tree trimming and replacement shall be accomplished in accordance with the following paragraphs.
- B. Trimming. Symmetry of the tree shall be preserved; no stubs or splits or torn branches left; clean cuts shall be made close to the trunk or large branch. Spikes shall not be used for climbing live trees. All cuts over 1-1/2 inches in diameter shall be coated with an asphaltic emulsion material.
- C. Replacement. The CONTRACTOR shall immediately notify the jurisdictional agency and/or the OWNER if any tree is damaged by the CONTRACTOR's operations. If, in the opinion of said agency or the OWNER, the damage is such that replacement is necessary, the CONTRACTOR shall replace the tree at its own expense. The tree shall be of a like size and variety as the tree damaged, or, the CONTRACTOR shall pay to the owner of said tree a compensatory payment acceptable to the tree owner, subject to the approval of the jurisdictional agency or OWNER.

1.7 PROTECTION OF EXISTING STRUCTURES

- A. Compaction Equipment and Operations. The CONTRACTOR shall restrict compaction operations as necessary to assure no damage occurs to adjacent buildings. This may require the use of smaller compaction equipment than is usually employed for trench backfill and roadway embankment compaction operations when in the vicinity of buildings sensitive to vibrating or other impact-type activities. It shall be the CONTRACTOR's responsibility to determine in which areas of the project the compaction operations must be restricted, to avoid damage to existing buildings. The foregoing restrictions on the size of, and magnitude of impact energy exerted by, compaction equipment will in no way relieve the CONTRACTOR from the compaction requirements as specified in other Sections of the Contract.

**SECTION 01530 - PROTECTION AND RESTORATION
OF EXISTING FACILITIES**

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01550 - SITE ACCESS AND STORAGE

PART 1 - GENERAL

1.1 HIGHWAY LIMITATIONS

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

1.2 TEMPORARY CROSSINGS

- A. General. Continuous, unobstructed, safe, and adequate pedestrian and vehicular access shall be provided to fire hydrants, commercial and industrial establishments, private residences, churches, schools, parking lots, service stations, motels, fire and police stations, and hospitals. Safe and adequate public transportation stops and pedestrian crossings at intervals not exceeding 200 feet shall be provided. The CONTRACTOR shall cooperate with parties involved in the delivery of mail and removal of trash and garbage so as to maintain existing schedules for such services. Vehicular access to residential driveways shall be maintained to the property line except when necessary construction precludes such access for reasonable periods of time, as approved by the ENGINEER.
- B. Temporary Bridges. Wherever necessary, the CONTRACTOR shall provide suitable temporary bridges or steel plates over unfilled excavations, except in such cases as the CONTRACTOR shall secure the written consent of the individuals or authorities concerned to omit such temporary bridges or steel plates, which written consent shall be delivered to the ENGINEER prior to excavation. All such bridges or steel plates shall be maintained in service until access is provided across the backfilled excavation. Temporary bridges or steel plates for street and highway crossing shall conform to the requirements of the authority having jurisdiction in each case, and the CONTRACTOR shall adopt designs furnished by said authority for such bridges or steel plates, or shall submit designs to said authority for approval, as may be required.

1.3 MAINTENANCE OF TRAFFIC

- A. General. Unless otherwise provided, the roadway undergoing improvements shall be kept open to all traffic by the CONTRACTOR. Nothing herein shall be construed to entitle the CONTRACTOR to the exclusive use of any public street, alleyway, or parking area during the performance of the WORK hereunder, and it shall so conduct its operations as not to interfere unnecessarily with the authorized work of utility companies or other agencies in such streets, alleyways, or parking areas. The CONTRACTOR shall provide unimpeded access through the project limits for emergency vehicles and make every effort to provide minimum delay to United States Postal Service vehicles and garbage collection vehicles.
- B. The CONTRACTOR shall submit three (3) copies of a traffic control plan to City the ENGINEER for approval a minimum of two (2) weeks prior to construction. The ENGINEER reserves the right to observe these traffic control plans in use and to make any changes as field conditions warrant. Any changes shall supersede these plans and be done solely at the CONTRACTOR's expense.
- C. No street shall be closed to the public without first obtaining permission of the ENGINEER and proper governmental authority. Where so provided on the plans or otherwise approved by the ENGINEER, the CONTRACTOR may by-pass traffic over a detour route. When no longer required, the detour shall be removed and the approached obliterated.

SECTION 01550 - SITE ACCESS AND STORAGE

- D. Where excavation is being performed in primary streets or highways, one lane in each direction shall be kept open to traffic at all times unless otherwise indicated. Toe boards shall be provided to retain excavated material if required by the ENGINEER or the agency having jurisdiction over the street or highway. Fire hydrants on or adjacent to the WORK shall be kept accessible to fire-fighting equipment at all times. Temporary provisions shall be made by the CONTRACTOR to assure the use of sidewalks and the proper functioning of all gutters, storm drain inlets, and other drainage facilities.
- E. The CONTRACTOR's equipment shall stop at all points of intersection with the traveling public unless satisfactory traffic control measures, approved in writing by the ENGINEER, are installed and maintained at CONTRACTOR's expense.
- F. When the CONTRACTOR is required to maintain traffic through grading, roadway excavation and embankment areas, the construction shall be conducted in such a manner as to provide a reasonably smooth and even surface satisfactory for use by public traffic at all times. The surface of the roadbed shall be properly crowned for drainage. In advance of other grading operations, sufficient fill shall be placed at culverts and bridges to permit traffic to cross unimpeded. Part width construction techniques shall be employed when the traffic is routed through roadway cuts or over embankments under construction. The material shall be excavated or placed in layers and the construction activities shall be alternated from one side to the other, with traffic routed over the side opposite the one under construction.
- G. During the removal and laying of culvert pipe, a maximum time of one hour of road closure may be permitted, providing the removal and laying of the culvert pipe cannot be completed for one-half width of the roadway and provided that a detour cannot be constructed around the culvert being laid. Closure shall be scheduled so as not to delay buses and peak hour traffic. The CONTRACTOR shall post, at the site of the closure within view of the waiting public traffic, the time the closure started and the time the road will again be open to traffic. The CONTRACTOR shall notify the Fire and Police Departments of such closures prior to commencement of work.
- H. At intervals of 48 hours and 24 hours prior to start up of construction operations, and at weekly intervals during the construction period, the CONTRACTOR shall broadcast on all local radio stations the precise location, time of commencement, and proposed completion date of the WORK scheduled for the following week which will require detouring or otherwise effect public traffic. Detours shall be described in sufficient detail to efficiently inform the traveling public of the modified traffic pattern. The cost of these advertisements shall be considered incidental to other contract bid items. The CONTRACTOR will notify the property owners 24 hours prior to commencement of WORK.
- I. When, in the opinion of the ENGINEER, conditions are such that the safety and/or convenience of the traveling public is adversely affected, the CONTRACTOR will be immediately notified in writing. The notice will state the defect(s) and the corrective action(s) required. In the event that the CONTRACTOR neglects to take immediate corrective action, the ENGINEER may suspend all work on the project until satisfactory corrective action is performed. In the event the CONTRACTOR does not take corrective action within 24 hours, the ENGINEER may order such work as deemed necessary for public convince and safety accomplished by outside forces. The cost of this work shall be deducted from any monies due or that may become due under the terms or the contract.
- J. The CONTRACTOR shall bear all expense of maintaining the traffic over the section of road undergoing improvement, including dust control and snow plowing, and of constructing and maintaining such approaches, crossings, intersections, and other features as may be necessary, without direct compensation, except as provided below:

SECTION 01550 - SITE ACCESS AND STORAGE

1. Special Detours. When the proposal contains a bid item for detours, the payment for such item shall cover all cost of constructing and maintaining such detour or detours, including the construction of any and all temporary bridges and accessory features and the removal of the same, and obliteration of the detour road. Right-of-way for temporary highways or bridges will be furnished by the Haines Borough.
 2. Maintenance of Traffic During Suspension of WORK. The CONTRACTOR shall make passable and shall open to traffic such portions of the project and temporary roadways as may be agreed upon between the CONTRACTOR and the ENGINEER for the temporary accommodation of necessary traffic during the anticipated period of suspension. If the suspension is seasonal (winter shutdown), thereafter, and until an issuance of an order for the resumption of construction operations, the maintenance of the temporary route of line of travel agreed upon will be the responsibility of the Haines Borough. Prior to the Haines Borough accepting the project for winter shutdown, the CONTRACTOR shall do all work necessary to provide a roadway surface and subgrade that will not require the Haines Borough to perform additional maintenance work during the shutdown period, except for purpose of snow removal. If the WORK is suspended due to unfavorable weather, failure of the CONTRACTOR to correct conditions unsafe for the workers or the general public, failure to carry out provisions of the Contract, or for failure to carry out orders of the ENGINEER, all costs for maintenance of traffic during the suspended period shall be borne by the CONTRACTOR. When WORK is resumed, the CONTRACTOR shall replace or renew any WORK or materials lost or damaged because of temporary use of the project; shall remove, to the extent directed by the ENGINEER, any work or materials used in the temporary maintenance; and shall complete the project as though its prosecution had been continuous and without interference.
- K. Traffic Control. All locations requiring redirection or stopping of the traveling public shall be properly signed and/or flagged by the CONTRACTOR. For the protection of traffic in public or private streets and ways, the CONTRACTOR shall provide, flaggers and provide, place, and maintain all necessary barricades, traffic cones, warning signs, lights, and other safety devices in accordance with the requirements of the "Manual of Uniform Traffic Control Devices, Part VI - Traffic Controls for Street and Highway Construction and Maintenance Operations," (MUTCD) published by U.S. Department of Transportation, Federal Highway Administration (ANSI D6.1) with the current State of Alaska supplements.
- L. The CONTRACTOR shall take all necessary precautions for the protection of the WORK and the safety of the public. All barricades and obstructions shall be illuminated at night, and all lights shall be kept burning from sunset until sunrise. The CONTRACTOR shall station such guards or flaggers and shall conform to such special safety regulations relating to traffic control as may be required by the public authorities within their respective jurisdictions. All signs, signals, and barricades shall conform to the requirements of Subpart G, Part 1926, of the OSHA Safety and Health Standards for Construction.
- M. Special pedestrian detours are often necessary in areas adjacent to new construction or demolition of existing structures. The ENGINEER shall determine when walkways are required. Plans for walkways must be approved by the ENGINEER.
- N. The CONTRACTOR shall remove traffic control devices when no longer needed, repair all damage caused by installation of the devices, and shall remove post settings and backfill the resulting holes to match grade.
- O. Temporary Street Closure. If closure of any street is required during construction, the CONTRACTOR shall apply in writing to the City ENGINEER and any other jurisdictional agency at least 30 days in advance of the required closure and again at 48 hours. A Detour and Traffic Control Plan shall accompany the application.

SECTION 01550 - SITE ACCESS AND STORAGE

- P. The CONTRACTOR shall notify the Police and Fire Departments and any other affected agency of all planned street closures. Notification shall consist of giving the time of commencement and proposed date of completion of work and names of street, schedule of operations, and routes of detours. Such notification shall be given at least 48 hours before such closure is to take effect.
- Q. Temporary Driveway Closure. The CONTRACTOR shall maintain access to all residential, commercial and street approaches. Any temporary closures shall require prior approval by the ENGINEER. The CONTRACTOR shall notify the owner or occupant (if not owner-occupied) of the closure of the driveways to be closed more than one (1) eight-hour work day at least three (3) working days prior to the closure. The CONTRACTOR shall minimize the inconvenience and minimize the time period that the driveways will be closed. The CONTRACTOR shall fully explain to the owner/occupant how long the work will take and when closure is to start.
- R. On-Site Cellular Phones. The CONTRACTOR shall maintain one active cellular phone at the project site at all times with the phone number provided to the Haines Borough Fire, Police and Public Works Departments. The cellular phone shall be carried by the person in charge of the field operations. The CONTRACTOR shall provide and allow the use of the CONTRACTOR's radio frequency to facilitate communication between the CONTRACTOR and the ENGINEER.
- S. Street Closure Requirements. The following street closure allowances and limitations shall apply to this Contract, and shall take precedence over any conflicting public access requirements and limitations given elsewhere in the Contract Documents.
1. The CONTRACTOR will not be permitted to obstruct vehicular traffic between the hours of 4:30pm and 8:00am, seven days per week.
 2. Emergency vehicle, pedestrian, garbage, and mail delivery access is required at all times. The CONTRACTOR shall contact Arrow Refuse, Inc. regarding any work affecting scheduled garbage pickup.
 3. Street closure to vehicular traffic will not be permitted until all project site residents or other users of project site parking lots affected by the closure have been notified. This notification shall be given at least 8 hours prior to the closure.
 4. At the time of each road closure, the CONTRACTOR shall contact the Fire and Police Departments and inform them of the planned period of closure. Further contact shall be made when the planned closure period is changed.

1.4 CONTRACTOR'S WORK AND STORAGE AREA

- A. The CONTRACTOR shall make its own arrangements for any necessary off-site storage or shop areas necessary for the proper execution of the WORK.
- B. Should the CONTRACTOR find it necessary to use any additional land for its camp or for other purposes during the construction of the WORK, it shall provide for the use of such lands at its own expense.
- C. The CONTRACTOR shall construct and use a separate storage area for hazardous materials used in constructing the WORK.
1. For the purpose of this paragraph, hazardous materials to be stored in the separate area are all products labeled with any of the following terms: Warning, **Caution**,

SECTION 01550 - SITE ACCESS AND STORAGE

Poisonous, Toxic, Flammable, Corrosive, Reactive, or Explosive. In addition, whether or not so labeled, the following materials shall be stored in the separate area: diesel fuel, gasoline, new and used motor oil, hydraulic fluid, cement, paints and paint thinners, two-part epoxy coatings, sealants, asphaltic products, glues, solvents, wood preservatives, sand blast materials, and spill absorbent.

2. The CONTRACTOR shall develop and submit to the ENGINEER a plan for storing and disposing of the materials above.
3. The CONTRACTOR shall obtain and submit to the ENGINEER a single EPA number for wastes generated at the site.
4. The separate storage area shall meet all the requirements of all authorities having jurisdiction over the storage of hazardous materials.
5. The separate storage area shall be inspected by the ENGINEER prior to construction of the area, upon completion of construction of the area, and upon clean-up and removal of the area.
6. All hazardous materials which are delivered in containers shall be stored in the original containers until use. Hazardous materials which are delivered in bulk shall be stored in containers which meet the requirements of authorities having jurisdiction.

1.5 PARKING

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01570 – EROSION CONTROL

PART 1 - GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall provide for erosion control during construction in accordance with the requirements of the Alaska Department of Environmental Conservation (ADEC) and the Environmental Protection Agency (EPA). All sedimentation from on-site drainage shall be caught on-site.
- B. The WORK under this section includes providing all labor, materials, tools and equipment necessary to construct and maintain temporary erosion control works; including but not limited to, silt fences, settling ponds, hay or straw bale, check dams, ditches, etc..

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Materials shall be suitable for the intended use and perform effectively to control silt and surface erosion. All materials shall remain the property of the CONTRACTOR.

PART 3 - EXECUTION

3.1 GENERAL

- A. The CONTRACTOR shall install temporary erosion control structures and devices as necessary and/or as directed by the ENGINEER. They shall be maintained in effective operating condition at all times. Catch basin silt screens, silt fences and any other silt collection devices shall be cleaned whenever they have become half-filled with silt or debris, and other items shall be cleaned, repaired, or replaced as necessary. Prior to completion of work, the CONTRACTOR shall clean and remove all silt and debris from the settling pond and check dams.
- B. Temporary erosion control structures shall remain in place until replaced by permanent erosion control WORK, or until the ENGINEER approves their removal.
- C. The CONTRACTOR shall be responsible for meeting the requirements of all permits (including permits naming the OWNER, or other parties) required near streams and water bodies and, therefore, shall be responsible for the quality of the run-off water from the Project site and for any fine and penalties resulting from the construction operation
- D. The CONTRACTOR is responsible to prepare, submit and maintain a Storm Water Pollution Prevention Plan (SWPPP) in accordance with the Alaska Construction General Permit (CGP) to the EPA and ADEC that is in accordance

with their construction methodologies and sequences. This includes submission of a Notice of Intent (NOI) to the EPA.

- E. The CONTRACTOR shall submit to the ENGINEER an Erosion and Sediment Control Plan, a copy of the NOI and documentation of their submittal of the SWPPP to ADEC, prior to beginning any WORK at the Project site. WORK at the Project site will not be permitted until approval of this plan has been obtained from the governing agency or agencies.

END OF SECTION

SECTION 01600 - MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.1 GENERAL

- A. The word "Products," as used herein, is defined to include purchased items for incorporation into the WORK, regardless of whether specifically purchased for project or taken from CONTRACTOR's stock of previously purchased products. The word "Materials," is defined as products which must be substantially cut, shaped, worked, mixed, finished, refined, or otherwise fabricated, processed, installed, or applied to form units of work. The word "Equipment" is defined as products with operational parts, regardless of whether motorized or manually operated, and particularly including products with service connections (wiring, piping, and other like items). Definitions in this paragraph are not intended to negate the meaning of other terms used in Contract Documents, including "specialties," "systems," "structure," "finishes," "accessories," "furnishings," special construction," and similar terms, which are self-explanatory and have recognized meanings in the construction industry.
- B. Neither "Products" nor "Materials" nor "Equipment" includes machinery and equipment used for preparation, fabrication, conveying and erection of the WORK.

1.2 QUALITY ASSURANCE

- A. Source Limitations. To the greatest extent possible for each unit of work, the CONTRACTOR shall provide products, materials, or equipment of a singular generic kind from a single source.
- B. Compatibility of Options. Where more than one choice is available as options for CONTRACTOR's selection of a product, material, or equipment, the CONTRACTOR shall select an option which is compatible with other products, materials, or equipment already selected. Compatibility is a basic general requirement of product/material selections.

1.3 PRODUCT DELIVERY/STORAGE/HANDLING

- A. The CONTRACTOR shall deliver, handle, and store products in accordance with manufacturer's written recommendations and by methods and means which will prevent damage, deterioration, and loss including theft. Delivery schedules shall be controlled to minimize long-term storage of products at site and overcrowding of construction spaces. In particular, the CONTRACTOR shall ensure minimum holding or storage times for products recognized to be flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other sources of loss.

1.4 TRANSPORTATION AND HANDLING

- A. Products shall be transported by methods to avoid product damage and shall be delivered in undamaged condition in manufacturer's unopened containers or packaging.
- B. The CONTRACTOR shall provide equipment and personnel to handle products, materials, and equipment by methods to prevent soiling and damage.
- C. The CONTRACTOR shall provide additional protection during handling to prevent marring and otherwise damaging products, packaging, and surrounding surfaces.

SECTION 01600 - MATERIALS AND EQUIPMENT

1.5 STORAGE AND PROTECTION

- A. Products shall be stored in accordance with manufacturer's written instructions, with seals and labels intact and legible. Sensitive products shall be stored in weather-tight climate controlled enclosures and temperature and humidity ranges shall be maintained within tolerances required by manufacturer's written instructions.
- B. For exterior storage of fabricated products, they shall be placed on sloped supports above ground. Products subject to deterioration shall be covered with impervious sheet covering; ventilation shall be provided to avoid condensation.
- C. Loose granular materials shall be stored on solid surfaces in a well-drained area and shall be prevented from mixing with foreign matter.
- D. Storage shall be arranged in a manner to provide access for maintenance and inspection. The CONTRACTOR shall periodically inspect to assure products are undamaged and are maintained under required conditions.

1.6 MAINTENANCE OF STORAGE

- A. Stored products shall be periodically inspected on a scheduled basis. The CONTRACTOR shall maintain a log of inspections and shall make said log available to the ENGINEER on request.
- B. The CONTRACTOR shall verify that storage facilities comply with manufacturer's product storage requirements.
- C. The CONTRACTOR shall verify that manufacturer-required environmental conditions are maintained continually.
- D. The CONTRACTOR shall verify that surfaces of products exposed to the elements are not adversely affected and that any weathering of finishes does not occur.
- E. For mechanical and electrical equipment, the CONTRACTOR shall provide a copy of the manufacturer's service instructions with each item and the exterior of the package shall contain notice that instructions are included.
- F. Products shall be serviced on a regularly scheduled basis, and a log of services shall be maintained and submitted as a record document prior to acceptance by the OWNER in accordance with the Contract Documents.

PART 2 – PRODUCTS & PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01700 - PROJECT CLOSE-OUT

PART 1 - GENERAL

1.1 FINAL CLEAN-UP

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

1.2 CLOSEOUT TIMETABLE

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

1.3 FINAL SUBMITTALS

- A. The CONTRACTOR, prior to requesting final payment, shall obtain and submit the following items to the ENGINEER for transmittal to the OWNER:
1. Written guarantees, where required.
 2. Maintenance stock items; spare parts; special tools, where required.
 3. Completed record drawings.
 4. Certificates of inspection and acceptance by local governing agencies having jurisdiction.
 5. Releases from all parties who are entitled to claims against the subject project, property,
 6. Completed Compliance Certificate and Release Form (found at the end of this section) for all contractors involved in the WORK.
 7. A final Subcontractor list complete with final subcontract amounts and including all equipment rentals (with operators).
- B. Before Final Payment can be made the CONTRACTOR shall supply a copy of the "Notice of Completion of Public Works" form approved by the Wage and Hour Administration of the Labor Standards and Safety Division of the Alaska Department of Labor and Workforce Development.

1.4 MAINTENANCE AND GUARANTEE

- A. The CONTRACTOR shall comply with the maintenance and guarantee requirements contained in Article 13 of the General Conditions.
- B. Replacement of earth fill or backfill, where it has settled below the required finish elevations, shall be considered as a part of such required repair work, and any repair or resurfacing constructed by the CONTRACTOR which becomes necessary by reason of such settlement shall likewise be considered as a part of such required repair work unless the CONTRACTOR shall have obtained a statement in writing from the affected private owner or public agency

SECTION 01700 - PROJECT CLOSE-OUT

releasing the OWNER from further responsibility in connection with such repair or resurfacing.

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

SECTION 01700 - PROJECT CLOSE-OUT

COMPLIANCE CERTIFICATE AND RELEASE FORM

PROJECT: Haines 2016 Wastewater Treatment Plant Upgrade

The CONTRACTOR must complete and submit this to the Haines Project Manager with respect to the entire contract.

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

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

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

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

_____ Capacity: CONTRACTOR
Firm Name

Signed Printed Name and Title Date

Return completed form to: Brad Ryan, Project Manager, Haines Borough, P.O. Box 1209, Haines, AK 99801. Call (907) 766-2231 if we can be of further assistance or if you have any questions.

END OF SECTION

COMPLIANCE CERTIFICATE AND RELEASE FORM

PROJECT: HAINES BOROUGH 2016 Wastewater Treatment Plant Upgrade

The CONTRACTOR must complete and submit this to the Haines Borough Project Manager. The CONTRACTOR shall complete this form with respect to the entire contract.

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

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

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

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

_____ Capacity: CONTRACTOR
Firm Name

Signed Printed Name and Title Date

Return completed form to: Brad Ryan, Haines Borough Project Manager, Haines Borough, P.O. Box 1209, Haines, AK 99827.

END OF SECTION

SECTION 01704 - FINAL CLEAN-UP AND SITE RESTORATION

PART 1 - GENERAL

1.1 DESCRIPTION

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

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 CONSTRUCTION

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

END OF SECTION

SECTION 02050 - DEMOLITION

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall furnish materials, equipment and labor necessary to perform and complete demolition work called for in the Contract Documents.
- B. Building structures, foundations, slabs, roofs and supporting walls shall be demolished as shown, in an orderly and careful manner.
- C. The WORK shall include, but not be limited to, removal of existing piping, electrical (fixtures, conduits and wiring), mechanical (ducts and equipment), floors, walls, ceilings, doors, windows, wood or metal framing, masonry, concrete slabs, concrete walls and asphaltic paving.
- D. Manufactured articles, materials, equipment, and accessories shall be demolished as shown and in accordance with the manufacturer's specifications and recommendations, and industry standards, unless otherwise shown or specified.
- E. Building utilities shall be disconnected, removed, capped and identified as necessary and as shown.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. All codes, as referenced herein, are specified in Section 01090, "Reference Standards."

1.3 CONTRACTOR SUBMITTALS

- A. **General:** Submittals shall be in accordance with Section 01300, "Contractor Submittals."
- B. **Demolition Schedule:** The CONTRACTOR shall submit a complete coordination schedule for demolition work including shut-off and continuation of utility services prior to start of the work. The schedule shall indicate proposed methods and operations of facility demolition, and provide a detailed sequence of demolition and removal work to ensure uninterrupted operation of occupied areas.

1.4 JOB CONDITIONS

- A. **Condition of Facilities:** OWNER assumes no responsibility for actual condition of facilities to be demolished. The CONTRACTOR shall visit the site and inspect the existing facilities.

PART 2 -- PRODUCTS (Not Used)

PART 3 -- EXECUTION

3.1 OCCUPANCY AND POLLUTION CONTROL

- A. Water sprinkling, temporary enclosures, chutes, and other suitable methods shall be used to limit dust and dirt rising and scattering in the air. Comply with government regulations pertaining to environmental protection.

SECTION 02050 - DEMOLITION

- B. Water shall not be used when it creates hazardous or objectionable conditions such as ice, flooding, or pollution.

3.2 PROTECTION

- A. Safe passage of persons around area of demolition shall be ensured. Operations shall be conducted to prevent damage to adjacent buildings, structures, other facilities, and people.
- B. Interior and exterior shoring, bracing, or supports shall be provided to prevent movement, settlement or collapse of structures to be demolished, and to adjacent facilities to remain.
- C. Existing landscaping materials, structures, and appurtenances, which are not to be demolished shall be protected and maintained as necessary and in accordance with Section 01530, "Protection of Existing Facilities."
- D. The CONTRACTOR shall protect and maintain conduits, drains, sewers, pipes, and wires that are to remain on the property.

3.3 STRUCTURE DEMOLITION

- A. Building structures and appurtenances shall be demolished as shown and required to complete work within limitations of governing regulations.
- B. Small structures may be removed intact when acceptable to the ENGINEER and approved by authorities having jurisdiction.
- C. Demolition shall proceed in a systematic manner, from top of structure to ground.
- D. Concrete and masonry shall be demolished in small sections. Use bracing and shoring to prevent collapse.
- E. Demolition equipment shall be dispersed throughout structure and demolished materials removed to prevent excessive loads on supporting walls, floors or framing.
- F. In areas to be remodeled, cut back flush and seal any pipe stub-outs remaining, and remove exposed piping, conduits, fixtures, J-boxes, light fixtures, water fixtures, and supports. Switches, receptacles, and boxes shall also be removed. Concealed piping and conduits shall be removed or capped and abandoned as necessary to facilitate the remodeling work. All other items shall be removed as shown.]

3.4 BELOW-GRADE DEMOLITION

- A. Footings, foundation walls, below-grade construction and concrete slabs on grade shall be demolished and removed to a depth which will not interfere with new construction, but not less than 12 inches below existing ground surface or future ground surface, whichever is lower.
- B. Below-grade areas and voids resulting from demolition of structures shall be completely filled.

SECTION 02050 - DEMOLITION

- C. All fill and compaction shall be in accordance with Section 02202, "Excavation and Embankment."
- D. After fill and compaction, surfaces shall be graded to meet adjacent contours and to provide flow to surface drainage structures, or as shown.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

- A. Demolition and removal of debris shall be conducted to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities which shall not be closed or obstructed without permission from the OWNER. Alternate routes shall be provided around closed or obstructed traffic ways.
- B. Site debris, rubbish, equipment, piping and any other items resulting from the demolition work required by the Contract shall be removed and disposed of at the CONTRACTOR'S expense. All such disposal activities shall be conducted in accordance with all applicable State and local requirements.

3.6 PATCHING AND REPAIRING

- A. The CONTRACTOR shall provide patching, replacing, repairing, and refinishing of damaged areas involved in demolition as necessary to match the existing adjacent surfaces whether shown or not shown.
- B. The CONTRACTOR shall repair all damages caused to adjacent facilities by demolition at no cost to the OWNER.
- C. The CONTRACTOR shall make a detailed inspection after patching and repairing has been completed, and shall carefully remove splatterings of mortar from adjoining work (particularly, but not limited to, plumbing fixtures, trim, tile, and finish metal surfaces), and make good any damage caused by such cleaning operations.

3.7 CLEANING

- A. During and upon completion of work, the CONTRACTOR shall promptly remove unused tools and equipment, surplus materials, rubbish, debris, and dust and shall leave areas affected by work in a clean, approved condition in accordance with Section 01700, "Project Closeout."
- B. Clean adjacent structures and facilities of dust, dirt, and debris caused by demolition, as directed by the ENGINEER or governing authorities, and return adjacent areas to condition existing prior to start of work.
- C. The CONTRACTOR shall remove and legally dispose of demolished materials and debris from the site.

END OF SECTION

SECTION 02201 - CLEARING AND GRUBBING

PART 1 - GENERAL

1.1 GENERAL

- A. The WORK under this Section includes providing all labor, materials, tools and equipment necessary for clearing, grubbing, removing and disposing of all trees, tree clusters, stumps, brush, and other vegetation and debris (including earthen materials incidentally removed with vegetation and debris), and removing structures and obstructions located within the limits of clearing and grubbing shown on the plans, except such objects as are designated to remain in place or are to be removed in accordance with other sections of these Specifications. The WORK shall also include the preservation from injury or defacement of all vegetation and objects designated to remain.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 GENERAL

- A. The OWNER will establish the limits of the WORK and will designate all trees, plants, shrubs and other items to remain. The CONTRACTOR shall protect and preserve all items designated to remain.
- B. Miscellaneous trimming of trees or shrubs designated to remain shall be conducted when directed by the OWNER. Trimming shall be in accordance with good tree surgery practice.
- C. All vegetation and debris to be removed shall be disposed of by the CONTRACTOR within areas indicated on the plans or approved by the OWNER. When burning is permitted, it shall be under the constant care of competent watchmen, and performed in such a manner that anything designated to remain on the right-of-way, the surrounding forest cover, or other adjacent property will not be jeopardized. Burning shall be done in accordance with all applicable laws and ordinances. The CONTRACTOR shall obtain all required permits.
- D. The CONTRACTOR is responsible to secure waste disposal sites, including obtaining written permission of the owner and any required permits, if none is indicated on the Plans. The cost of securing such sites shall be borne by the CONTRACTOR. If requested by the OWNER, the CONTRACTOR shall furnish the permit numbers of all required permits for disposal sites.
- E. Merchantable timber within the clearing limits will become the property of the Contractor, unless otherwise specified.
- F. No trees, shrubs or other plantings shall be disturbed or otherwise damaged, unless shown on the Plans or directed by the OWNER.

END OF SECTION

SECTION 02202 - EXCAVATION AND EMBANKMENT

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The WORK under this Section includes providing all labor, materials, tools and equipment necessary for excavation for buildings and piping and placing backfill and imported backfill to the lines, grades and cross sections indicated in the Plans.

PART 2 - PRODUCTS

2.1 EXCAVATION

- A. All excavation shall be unclassified excavation, and shall consist of excavation and disposal of all materials, of whatever character, encountered in the WORK.

2.2 BACKFILL/IMPORTED BACKFILL

- A. Material for backfill shall consist of excavated earth, sand, gravel, fractured rock or combination thereof containing no muck, peat, frozen materials, roots, sod or other deleterious materials, and shall be compactable to the density required by the specifications.

Imported Backfill shall conform to the following gradation:

SIEVE DESIGNATION	PERCENT PASSING BY WEIGHT
3-Inch	100
2-Inch	85 - 100
No. 4	30 - 70
No. 200*	8 Max.

**Gradation shall be determined on that portion passing the 3-inch screen*

- B. The amount of No. 200 material shall have no more than 3% by weight less than the 0.02 mm size.

SECTION 02202 - EXCAVATION AND EMBANKMENT

2.3 SHOT ROCK BORROW

A. Shot Rock Borrow shall conform to the following gradation:

SIEVE DESIGNATION	PERCENT PASSING BY WEIGHT
6-inch	100
4-inch	50 – 85
3-inch	10 - 30
No.200*	0 – 3

**Gradation shall be determined on that portion passing the 3-inch screen.*

PART 3 - EXECUTION

3.1 EXCAVATION

- A. Clearing and grubbing in excavation areas must be completed prior to beginning excavation operations.
- B. Excavations shall be reasonably smooth and uniform to the lines, grades and cross sections shown in the Plans. Excavations shall be conducted to insure that material outside of excavation limits remains undisturbed.
- C. Excavations shall be protected from erosion and maintained to drain freely at all times.
- D. Excavation in rock shall be to a minimum depth of 18 inches below the top of the finished surface within the limits of the roadbed. Undrained pockets shall not be left in the excavated surface of the rock.
- E. Where excavation to the limits indicated on the Plans encounters unsuitable underlying material, the OWNER may require the CONTRACTOR to remove the unsuitable material and backfill with approved material. The CONTRACTOR shall allow time to take the necessary cross section measurements before backfill is placed.
- F. Excavated soils that do not meet the requirements for backfill material and surplus suitable excavation meeting the requirements for backfill shall be disposed of by the CONTRACTOR at a location and in a manner approved by the OWNER. No material may be wasted without the prior approval of the OWNER.
- G. The CONTRACTOR is responsible for securing waste disposal sites if they are not indicated on the Plans. The CONTRACTOR shall obtain the written permission of the Landowner for use of all disposal sites, and shall either obtain any required permits or assure that they have been obtained by others. If requested by the OWNER, the CONTRACTOR shall furnish the permit numbers of all required permits for the disposal sites. The cost of securing such sites shall be borne by the CONTRACTOR.

SECTION 02202 - EXCAVATION AND EMBANKMENT

- H. If the CONTRACTOR fails to comply with the provisions of any city ordinance or permit pertaining to waste disposal or disposal sites; the OWNER shall have the right, after giving 30 days written notice, to bring the disposal sites into compliance and collect the cost of the work from the CONTRACTOR, either directly or by withholding monies otherwise due under the Contract.
- I. Temporary storage of useable or suitable excavation meeting the requirements for backfill is the responsibility of the CONTRACTOR, and no additional payment will be made.
- J. The CONTRACTOR shall conduct all operations to prevent contaminating useable excavation meeting the requirements for backfill with unsuitable material.
- K. When frozen material is excavated and meets all other requirements for backfill material, it shall be allowed to thaw and drain prior to placing in the fill. This material will be considered useable excavation and no additional payment will be made.
- L. The CONTRACTOR shall provide added care when excavating adjacent to existing fences and houses. Damage caused to existing walls, fences and houses by the CONTRACTOR shall be repaired at the CONTRACTOR's expense.
- M. After excavation to the limits of excavation prior to backfilling, the bottom of the excavation shall be compacted with a excavator or backhoe mounted vibrating compactor until a firm base for the backfill material is obtained.

3.2 PLACING BACKFILL

- A. Backfill shall be constructed to a reasonably smooth and uniform shape conforming to the lines, grades and cross sections indicated on the Plans using all excavated material meeting the requirements for backfill prior to importing backfill.
- B. The underlying ground shall be properly prepared prior to placing backfill material. Clearing and Grubbing in embankment areas must be completed prior to embankment operations. Debris shall be removed and surface depressions or holes shall be filled with suitable material to a level uniform surface and compacted before the embankment is constructed.
- C. Fill areas over swampy ground may be constructed by end-dumping an initial lift of sufficient depth to support hauling and spreading equipment.
- D. The finish surface shall not vary more than 0.1-foot when tested using a 10-foot straightedge, nor more than 0.1-foot from established grade. The bottom of the subgrade shall not vary more than 0.10-foot from established grade. Additionally, the algebraic average of all deviations from established finished subgrade elevations taken at 100-foot intervals shall be less than 0.02-foot.

END OF SECTION

SECTION 02203 - TRENCHING

PART 1 - GENERAL

1.1 GENERAL

- A. The WORK under this section includes providing all labor, materials, tools and equipment necessary for the excavation and backfill required for installation of pipelines, manholes, vaults, diversion structures, and other appurtenances; and for ground surface restoration, including pavement.
- B. Bedding for this project shall meet the requirements for Bedding, Class B.

PART 2 - PRODUCTS

2.1 TRENCH EXCAVATION

- A. Trench excavation shall consist of all material, of whatever nature, excepting liquids, excavated from trenches within the limits described in Section 01025 - Measurement and Payment.

2.2 BEDDING

- A. Bedding, Class A, shall be aggregate conforming to the following gradation:

SIEVE DESIGNATION	PERCENT PASSING BY WEIGHT
1 1/2"	100
No. 4	0-35
No. 200	0-10

Bedding, Class

2.3

BACKFILL

- A. Backfill is defined as material placed above the level of bedding material. Backfill material consists of native material excavated from the trench that is determined by the OWNER to be suitable as backfill. Backfill material used within road prisms shall be granular material, non-frost susceptible, that is free of rocks larger than six inches, muck, frozen material, lumps, organic material, trash, lumber, or other debris. All backfill material available from trench excavation shall be utilized prior to the use of imported backfill.

2.4 IMPORTED BACKFILL

- A. Imported backfill shall be granular material, free draining, free of muck, frozen material, lumps, or organic material and shall conform to the following gradation:
- B.

SIEVE DESIGNATION	PERCENT PASSING BY WEIGHT
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SECTION 02203 - TRENCHING

3"	100
No. 4	20-70
No. 200	0-8

2.5 AGGREGATE BASE

- A. Aggregate base shall conform to Grading D-1 of Section 02204.

2.6 SHOT ROCK BORROW

- A. Shot Rock Borrow shall conform to the following gradation:

SIEVE DESIGNATION	PERCENT PASSING BY WEIGHT
6-inch	100
4-inch	50 – 85
3-inch	10 - 30
No.200*	0 – 3

**Gradation shall be determined on that portion passing the 3-inch screen.*

2.7 FILTER CLOTH

- A. Filter cloth shall be either woven or non-woven and shall meet the following requirements:

Grab tensile strength: 90 lbs. minimum (ASTM D 1682)

Bursting strength: 100 psi minimum (ASTM D 751)

Equivalent opening size: 40 minimum, 100 maximum

PART 3 - EXECUTION

3.1 EXCAVATION

- A. Prior to excavating trenches, all necessary clearing and grubbing shall be completed in accordance with the provisions of Section 02201 - Clearing and Grubbing.
- B. Excavation for trenches shall conform to the lines and grades shown on the Plans and to the limits depicted in the Standard Details. The CONTRACTOR shall also do any grading necessary to prevent surface water from entering the trench.
- C. Excavation of any and all material more than two feet below the invert of the pipe as shown on the Plans shall be done only when ordered in writing by the OWNER. The material so excavated will be handled in the manner described below.
- D. All excavated material suitable for use as backfill shall be piled in an orderly manner separately from unsuitable material, at a sufficient distance from the edge to prevent material

SECTION 02203 - TRENCHING

from sloughing or sliding back into the trench; except that when the trench is in a traveled roadway the OWNER may require removal and temporary storage of excavated material elsewhere.

- E. Material unsuitable for use as backfill shall be hauled to a CONTRACTOR furnished disposal site off the project, unless otherwise directed in writing by the OWNER. The CONTRACTOR is responsible for securing waste disposal sites if none are indicated on the Plans. The CONTRACTOR shall obtain the written permission of the Landowner for use of all disposal sites, and shall either obtain any required permits or assure that they have been obtained by others. If requested by the OWNER, the CONTRACTOR shall furnish the permit numbers of all required permits for the disposal sites. The cost of securing such sites shall be borne by the CONTRACTOR.
- F. If the CONTRACTOR fails to comply with the provisions of any city ordinance or permit pertaining to waste disposal or disposal sites; the OWNER shall have the right, after giving 30 days written notice, to bring the disposal sites into compliance and collect the cost of the WORK from the CONTRACTOR, either directly or by withholding monies otherwise due under the contract.
- G. No more than 150 feet of trench shall be open in advance of laying of pipe, and not more than ten feet of trench shall remain open at the end of each working period. When the trench is in a traveled roadway, it shall be completely backfilled, in accordance with the specifications, and opened to traffic at the end of each working period.
- H. If explosives are used, the CONTRACTOR shall obtain all necessary permits and comply with all pertinent regulations. All utility companies shall be informed a minimum of 48 hours prior to the use of explosives in the vicinity of their facilities.
- I. The CONTRACTOR shall protect and preserve all existing pavement throughout the entire construction period. No tracked equipment may be operated on any pavement without first protecting the pavement with pavement pads approved by the OWNER. All pavement which is damaged in any manner by the CONTRACTOR's operations shall be restored to original or better condition at the CONTRACTOR's expense.
- J. Where required to prevent caving of the trench, or by any safety law or regulation, the CONTRACTOR shall furnish and install bracing and/or sheeting to protect the excavation. This bracing and/or sheeting shall be removed as trench backfill progresses. Filter cloth will be installed in areas with sloughing soils.
- K. The CONTRACTOR shall remove and dispose of all water entering the excavation. Disposal of water shall be done in a manner to prevent damage or nuisance to adjacent property, and in accordance with all applicable laws and regulations. Pumps shall be adequate to maintain a dry trench during the bedding, pipe installation, and initial backfill to an elevation at least one foot above the top of pipe. No backfill may be placed in standing water under any circumstance, except when the Plans and/or specifications specifically permit installation of HDPE water pipe in a wet trench.
- L. Excavations for manholes and similar structures shall be large enough to provide proper working room. Any over depth excavation shall be backfilled with concrete or other approved material at the CONTRACTOR's expense.

SECTION 02203 - TRENCHING

- M. The CONTRACTOR shall provide temporary support of existing structures, as necessary to protect the structures from settlement or other disturbances caused by construction activities. All structures disturbed by the CONTRACTOR's activities shall be returned to original condition, or better.

3.2 BEDDING

- A. Bedding shall be placed in conformance with the lines and grades shown on the Plans and to the limits depicted in the Standard Details. Before placing any bedding material, the bottom of the trench shall be hand-raked ahead of the pipe laying operation to remove stones and lumps which will interfere with smooth and complete bedding of the pipe. The specified bedding material shall then be placed in layer(s) the full width of the trench, each layer not exceeding eight inches in thickness loose measure, and compacted to 95% of maximum density as determined by AASHTO T 180 D, until the elevation of the plan grade for the pipe invert is attained. The pipe bed shall then be fine-graded by hand and compacted as above. Bell holes shall be hand dug at the location of the joints and shall be of sufficient size to allow proper making of the joint and to prevent the collar or bell of the pipe from bearing on the bottom of the trench.
- B. After the pipe has been laid and approved for covering, the specified bedding material shall be placed evenly on both sides of the pipe for the full width of the trench. Approval for covering does not imply final acceptance of the pipe, or relieve the CONTRACTOR in any way of responsibility to complete the project in conformance with the Plans and Specifications. Bedding material shall be placed by hand in layers. The thickness, loose measure, of the first layer shall be either one-half the outside diameter of the pipe plus two inches or eight inches, whichever is least. This layer shall be compacted as specified above to provide solid support to the underside of the pipe. For pipe ten inches and smaller nominal diameter, the next layer shall be of the thickness required to complete placement of the bedding to a plane six inches above the pipe, after compaction as specified above.
- C. For pipe 12 inches and larger, the bedding material shall be placed and compacted in layers not more than 8 inches in thickness, loose measure, up to a plane 6 inches above the top of the pipe.
- D. The initial density test at any location will be paid for by the OWNER. If the initial test shows that the material compaction is not as specified, the CONTRACTOR shall modify the compaction methods used, as approved by the OWNER, and have the material retested until the tests show that the compaction meets the specification requirements. All tests, after the initial test at any given location, shall be paid for by the CONTRACTOR.

3.3 BACKFILL

- A. The trench shall be backfilled above the bedding material, as shown on the Plans, or in the Standard Details, with approved material saved from trench excavation. If there is not sufficient approved material from the excavation, the backfilling of the trench shall be completed utilizing suitable material from roadway excavation, or imported backfill. The

SECTION 02203 - TRENCHING

backfill and/or suitable material from roadway excavation shall be compacted to 95% of optimum density, as determined by AASHTO T 180-D. Lifts shall not exceed eight inches in depth for loose material. After backfilling of the trench is completed, any excess material from trench excavation shall be hauled to a CONTRACTOR furnished disposal site off the project.

- B. Where trenches cross roadways, streets or driveways, backfilling shall be done immediately following excavation and laying of the pipe. All crossings shall be backfilled, compacted, and open to traffic at the end of each day's work. Major road crossings shall be excavated and backfilled in half widths of the traveled way so that at least one-half of the roadway is open to controlled traffic at all times during the WORK. All WORK performed within a right-of-way shall be done in conformance with the appropriate permits issued by the respective agency having jurisdiction over the right-of-way.
- C. At least 24 hours prior to commencing backfilling operations, the CONTRACTOR shall notify the OWNER of the proposed method of compaction. No method will be approved until the CONTRACTOR has demonstrated, under actual field conditions, that such method will produce the degree of compaction required.
- D. The initial density test at any location will be paid for by the OWNER. If the initial test shows that the material compaction is not as specified, the CONTRACTOR shall modify the compaction methods used, as approved by the OWNER, and have the material retested until the tests show that the compaction meets the specification requirements. All tests, after the initial test at any given location, shall be paid for by the CONTRACTOR.

3.4 AGGREGATE BASE

- A. Aggregate base shall be placed in layers not exceeding six inches compacted depth, extending the full width of the trench and compacted to 95% of maximum density as determined by AASHTO T 180 D. The thickness of the top layer shall be such that, after compaction, the surface shall be at the elevation shown in the Plans or Standard Drawings. Care shall be taken to assure proper compaction near the sides of the trench, and to avoid segregation.

3.5 ADDITIONAL TRENCH EXCAVATION/SHOT ROCK BORROW

- A. In order to create a stable foundation for water and sewer pipe, the ENGINEER may order additional trench excavation greater than the six inches below the pipe invert required for installation of bedding material. The additional excavation ordered by the ENGINEER will be backfilled with Shot Rock Borrow meeting the requirements of this Section.

END OF SECTION

SECTION 02204 - BASE COURSE

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The work under this section includes providing all labor, materials, tools and equipment necessary for furnishing and placing one or more layers of aggregate base or leveling course on a prepared surface to the lines and grades shown on the Plans.

PART 2 - PRODUCTS

2.1 MATERIAL

- A. Aggregate base course shall consist of crushed gravel or crushed stone, conforming to the quality requirements of AASHTO M 147. The aggregate shall be free from lumps, balls of clay, or other objectionable matter, and shall be durable and sound.
- B. Base course material shall conform to one of the following gradations as specified:

BASE COURSE GRADATIONS (Percent passing by weight)								
Sieve Designation	A	B	C	C-1	D	D-1	E	E-1
4	100							
2	85-100	100						
1 ½				100				
1			100	70-100		100		
¾				60-90	100	70-100		100
3/8				45-75		50-80		
#4	30-70	30-70	40-75	30-60	45-80	35-65		45-80
#8				22-52		20-50		32-80
#10			25-55		30-65			
#40				8-30		8-30		
#200	0-10	3-10	4-10	0-6	4-12	0-6	0-6	0-6

- C. For gradings C, D, & E, at least 50% by weight of the particles retained on the No. 4 sieve shall have at least one fractured face as determined by Alaska T-4.
- D. For gradings C-1, D-1 & E-1, at least 70% by weight of the particles retained on a No. 4 sieve shall have at least one fractured face as determined by Alaska T-4.

PART 3 - EXECUTION

3.1 CONSTRUCTION

- A. Prior to placement of the base course, the underlying surface shall be prepared by dressing, shaping, wetting or drying, and compacting of the underlying material to a minimum density

SECTION 02204 - BASE COURSE

of 95% as determined by AASHTO T 180-D. Surfaces shall be cleaned of all foreign substances and debris.

- B. Any ruts or soft yielding spots that may appear shall be corrected by loosening and removing unsatisfactory material and adding approved material as required, reshaping, and recompacting the affected areas to the lines and grades indicated on the Plans. If required by the OWNER, the CONTRACTOR shall proof load questionable areas with a loaded truck or other piece of equipment approved by the OWNER.
- C. Blue tops shall be set to the top of base course. They shall be set by the Contractor at breaks in grade and on even grade at intervals not to exceed 50', with additional stakes at vertical curves.
- D. Base course material shall be deposited and spread in a uniform layer to the required grades, and to such loose depth that when compacted to the density required, the thickness will be as indicated on the Plans. Portions of the layer which become segregated shall be removed and replaced with a satisfactory mixture, or shall be remixed to the required gradation.
- E. The maximum compacted thickness of any one layer shall not exceed six inches. If the required compacted depth exceeds six inches, the base shall be constructed in two or more layers of approximately equal thickness. Each layer shall be shaped and compacted before the succeeding layer is placed.
- F. The base course shall be compacted to at least 95% of maximum density as determined by AASHTO T 180-D. In places not accessible to rolling equipment, the mixture shall be compacted with hand tamping equipment.
- G. Blading, rolling, and tamping shall continue until the surface is smooth and free from waves and irregularities. If at any time the mixture is excessively moistened, it shall be aerated by means of blade graders, harrows, or other approved equipment, until the moisture content is such that the surface can be recompacted and finished as above.
- H. The finished surface of the base course, when tested using a 10-foot straightedge, shall not show any deviation in excess of 3/8-inch between two contact points. The finish surface shall not vary more than 1/2-inch from established grade. Additionally, the algebraic average of all deviations from established grade of the finish base course surface elevations taken at 50-foot intervals shall be less than 0.02-foot.
- I. The initial density test at any location will be paid for by the OWNER. If the initial test shows that the material compaction is not as specified, the CONTRACTOR shall modify the compaction methods used, as approved by the OWNER, and have the material retested until the tests show that the compaction meets the specification requirements. All tests, after the initial test at any given location, shall be paid for by the CONTRACTOR.

END OF SECTION

SECTION 02401 – SANITARY SEWER PIPE

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The WORK under this Section includes providing all labor, materials, tools and equipment necessary for furnishing and installing sanitary sewer pipe, in accordance with these specifications and in reasonably close conformity with the lines and grades shown on the Drawings or established by the ENGINEER.
- B. This WORK includes furnishing and installing connecting bands, branch connections, elbows or other fittings, and all appurtenances required to complete the sanitary sewer.

1.2 SUBMITTALS. Sanitary Sewer Pipe: Material Certifications stating conformance with the requirements of this Section.

PART 2 - PRODUCTS

2.1 DUCTILE IRON PIPE (GRAVITY AND PRESSURE SEWER)

- A. Ductile Iron Pipe shall conform to ANSI A21.51. Pipe and fittings shall be cement mortar lined in conformance with ANSI A21.4 and shall have an exterior bituminous coating conforming to the requirements of ANSI A21.10. Pipe joints shall conform to ANSI A21.11 and shall be push-on type as manufactured by United States Pipe and Foundry Company for Tyton pipe, or equal.
- B. Prior to the use of any pipe, the CONTRACTOR shall furnish a certification from the pipe manufacturer that all required tests have been made and that the pipe fully complies with the requirements of ANSI A21.51.
- C. Nominal pipe diameter is shown on the Drawings. No change in pipe diameter shall be made unless approved by the ENGINEER. The minimum pipe strength shall be thickness Class 50. The pipe size and thickness class shall be clearly marked on each pipe.
- D. Where special fittings are required, they shall be fabricated from steel pipe manufactured in accordance with AWWA Standard C200. The steel fitting shall be fabricated with spigot ends suitable for connection to the ductile iron pipe, with cast iron transition couplings as manufactured by Smith-Blair, Inc., or equal. Steel fittings shall be lined and coated with fusion epoxy system as furnished by Water Works Supply Company, Union City, California, or with hot applied coal tar in accordance with AWWA C203.
- E. Connections between ductile iron pipe and PVC pipe shall be made with “ROMAC” Stainless Steel Sleeve, or approved equal.

2.2 PVC SEWER PIPE

- A. PVC Sewer Pipe, 4-inch through 15-inch, inclusive, shall have a standard dimension ratio (SDR) of 35 and conform to ASTM D 3034. Before any PVC pipe is used on this project, the CONTRACTOR shall supply certifications, signed by an authorized agent of the seller or manufacturer, stating that the material has been sampled, tested, and inspected in accordance with ASTM D 3034.

SECTION 02401 – SANITARY SEWER PIPE

- B. PVC Sewer Pipe, greater than 15-inch, shall conform to ASTM F 679. Before any PVC pipe is used, the CONTRACTOR shall supply certifications, signed by an authorized agent of the seller or manufacturer, stating that the material has been sampled, tested, and inspected in accordance with ASTM F 679.
- C. The pipe shall have integral wall bell and spigot joints conforming to ASTM D 3212. The bell shall consist of an integral wall section with a solid cross-section elastomeric ring, factory assembled, securely locked in place to prevent displacement.
- D. Flexible water-tight connections, approved by the ENGINEER, shall be used at PVC pipe connections to manholes and other rigid structures.

2.3 PVC PRESSURE PIPE

- A. PVC pressure pipe shall conform to the applicable requirements of ANSI/AWWA C900 and subject to additional requirements specified herein.
- B. The pipe shall be pressure class 100, and shall be furnished complete with rubber gaskets.
- C. Fittings for PVC pressure pipe shall be cement mortar lined ductile iron in conformance with ANSI A21.4 and shall have an exterior bituminous coating conforming to the requirements of ANSI A21.10.
- D. All joints for the buried PVC pipe shall be either an integral bell manufactured on the pipe or a separate coupling both employing a rubber ring joint. The bell and coupling shall be the same thickness as of the pipe barrel, or greater thickness. The sealing ring groove in the coupling shall be of the same design as the groove in cast iron fittings and valves available from local water works supply distributors.
- E. Flexible water-tight connections, approved by the ENGINEER, shall be used at PVC connections to manholes and other rigid structures.
- F. Connections between PVC Sewer Pipe and PVC Pressure Pipe (PVC (HP)), shall be made with “ROMAC” Stainless Steel Sleeve, or approved equal.

2.6 HDPE PRESSURE PIPE

- A. High Density Polyethylene (HDPE) pipe shall conform to ASTM D 3550 designation PE 3407 or PE 3408. The pipe shall have a minimum pressure rating of 100 pounds per square inch and a maximum Standard Dimension Ratio (SDR) of 17.0. All HDPE shall have a standard iron pipe size (IPS) outside diameter.
- B. The pipe shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions or other injurious defects. It shall be uniform in color, opacity, density, and other physical properties.
- C. HDPE pipe shall have an ASTM D-3350 material Cell Classification of no less than 335434C.
- D. The pipe shall be marked at 5-foot intervals with a coded number which identifies the

SECTION 02401 – SANITARY SEWER PIPE

manufacturer, SDR size, PPI rating, manufacturing standard reference and production code from which data and place of manufacturer can be determined.

- E. When HDPE pipe is connected to ductile iron pipe, a flange adapter shall be used. A flange coupling adapter shall be used on the ductile iron pipe. HDPE flange adapters shall be manufactured by the same manufacturer as the pipe using the same resin as the pipe. Each flange adapter shall be furnished with a ductile iron convoluted back-up ring drilled to match the standard ANSI bolt pattern for the nominal diameter of pipe used.
- F. Connection of the pipe and fittings shall be performed by the thermal butt fusion system. HDPE pipe lengths, fittings, and flange adapter connections to be fused shall be of the same type, grade and class of polyethylene compound and supplied by the same raw material supplier.

2.7 PVC PRESSURE PIPE WITH RESTRAINED JOINTS

- A. Piping for PVC Pressure Pipe with Restrained Joints shall be PVC Pressure Pipe as specified above.
- B. Pipe joints shall be restrained using Uniflange Series 1350 joint restraints or approved equal..

2.8 POLYETHYLENE PIPE

- A. Polyethylene Pipe shall conform to the requirements of ASTM F 714, with SDR of 32.5.
- B. Pipe shall be listed by the National Sanitation Foundation.
- C. Joints shall be made by butt-fusion, with connections to dissimilar materials by stub ends and backing flanges or steel/HDPE transition couplings.

2.9 ACRYLONITRILE-BUTADIENE-STYRENE (ABS) PIPE

- A. Acrylonitrile-Butadiene-Styrene (ABS) Pipe 4-inches in diameter shall conform to the requirements of ASTM D 2751. ABS Pipe 6-inches through 15-inches in diameter shall conform the requirements of AASHTO M 264 (ASTM D 2680).
- B. Joints shall be solvent welded using a primer and cement in accordance with the manufacturer's specifications. All joints shall be wiped clean and dry before applying the primer. All fittings shall be installed in accordance with the manufacturer's specifications.
- C. Handling, storage, and installation of pipe shall conform to the recommendations of the manufacturer.
- D. Truss pipe shall be used only with Fiberglass Reinforced Plastic (FRP) manholes using molded truss pipe connectors bonded to the barrel.

2.10 UNDERGROUND MARKING TAPE

- A. Underground marking tape shall be green, at least 4 inches wide, 4-mil thick, polyethylene tape, with a metallic backing capable of being traced with locators. The tape shall have black

SECTION 02401 – SANITARY SEWER PIPE

letters with the following wording: “Caution: Sewer Line Buried Below.” The marking tape shall be installed 12- inches above the top of all sewer mains and services.

PART 3 - EXECUTION

3.1 CONSTRUCTION

- A. Excavation, bedding, and backfill shall conform to the requirements of Section 02203 - Trenching. Underground marking tape shall be installed as shown on Standard Detail 125 – Paving Resurfacing & Trench Detail.
- B. Sheeting and bracing required for trenches shall be removed to the elevation of the conduit, but no sheeting will be allowed to be pulled, removed, or disturbed below the conduit.
- C. Before lowering into the trench, the pipe shall be inspected for defects, and all cracked, chipped, or broken pipe shall be discarded. The ends and interior of the pipe shall be clean. Belled ends shall be laid upgrade. Handling of the pipe shall be accomplished in a manner that will not damage the pipe. The joint shall be made in the manner recommended by the manufacturer. Care shall be taken not to buckle or disturb previously laid pipe.
- D. Pipe shall be laid accurately to the staked line and grade. All service connections shall be installed as indicated on the Drawings. Where existing service sewers are to be connected, suitable fittings and adapters shall be provided by the CONTRACTOR.
- E. Pipe shall be cleaned of all foreign matter, and water shall be kept out of trenches until joints have been completed. When work is not in progress, open ends of pipe and fittings shall be securely closed to keep foreign matter and rodents from entering.
- F. Each joint shall be inspected to ensure that it is properly made before backfilling is done. Care shall be taken to prevent any dirt or foreign matter from entering the open end of the pipe. Where it is necessary to cut pipe, such cuts shall be neatly made in an approved manner. The laid pipe shall be true to line and grade and, when completed, the sewer shall have a smooth and uniform invert. No section of gravity sewer, including service connections shall have an adverse grade which would pond water in the invert of the sewer.
- G. Connections to pipe stubs of a different pipe material shall be made with DFW/HPI non-shear-type connector, as shown in Standard Detail 218 – Coupling for Dissimilar Sanitary Sewer Pipes. Connectors must be approved by the ENGINEER prior to installation.
- H. Connections to pipe stubs of a different pipe material, if made beyond the back of sidewalk or other concrete or paved surface, shall be made with a suitable connector. Connectors must be approved by the ENGINEER prior to installation. Connection of all piping, other than bell and spigot connections, within the roadway, street and sidewalk areas, shall be made per Standard Detail 218 – Coupling for Dissimilar Sanitary Sewer Pipes.
- I. Connections to existing sewer mains, service connections, and manholes shall be made in such a manner so as not to damage the existing facility. Such connections shall be made so that no projections or rough surfaces occur within the pipe.
- J. Location of the sewer laterals are approximate and may be changed by the ENGINEER.

SECTION 02401 – SANITARY SEWER PIPE

Relocation of the sewer lateral will not add extra cost to the OWNER, unless either of the following conditions result:

1. the relocation results in a significant increase in the length of the lateral; or,
 2. there are significant differences in the surface characteristics at the new lateral location which would result in substantive and foreseeable changes in construction methods and materials.
- K. If the CONTRACTOR believes that the WORK at the new location(s) will result in a substantive change, the CONTRACTOR shall notify the ENGINEER prior to beginning the changed WORK. The ENGINEER will evaluate the request and if the relocation is warranted, the change in WORK shall be authorized.
- L. Lateral connections to existing sewer mains shall not obstruct flow and shall be one of the following:
1. Approved remote tapping system.
 2. Polyethylene saddle strapped to line with two stainless steel bands and neoprene gasket.
 3. Sidewall fused to line as recommended by pipe manufacturer.
 4. Manufactured saddle per Standard Detail 210 – Sanitary Sewer Saddle Tee.
- M. Cleanouts shall be provided with a cast iron ring and cover which shall be locking-type Olympic Foundry No. M-1025, or approved equal. The cover shall be clearly marked with the word “SEWER” case in.
- N. Lateral connections to new sewer mains shall be made with a manufactured sanitary wye of the same material as the mainline pipe.
- O. Locate Sewer Services shall require that the CONTRACTOR determine the location of the existing sewer services prior to installation of the mainline pipe in such a way that the service wyes can be installed in the proper location as the mainline pipe is being installed. No service saddles will be permitted, unless approved by the ENGINEER.
- P. Where gravity flow sanitary sewers cross above or less than 18-inches below waterlines, or approximately parallel water lines within ten-feet horizontally, the sewer pipe shall meet the requirements of ductile iron pipe or PVC pressure pipe, as described in Part 2 of this Section.
- Q. HDPE to HDPE connections shall be made by thermal butt fusion, in accordance with ASTM D2657. Fusion jointing shall utilize a pipe manufacturer approved fusion machine operated by experienced and qualified personnel. The CONTRACTOR shall provide three copies of a “Heat Fusion Qualification Guide,” published by the HDPE manufacturer, that provides criteria for inspection of thermal fusion joints. The guide shall include: criteria for operator training requirements and experience; visual inspection criteria (including photographs) for both intact thermal fusion joints and sample strips cut for thermal fusion joints. The thermal fusion machine operator shall perform a minimum of three test joints in the presence of the ENGINEER. The test joints will be examined from both exterior appearances and from appearance of the joint cross section once the samples have been cut into strips.
- R. Bolted HDPE to HDPE connections shall include a polyethylene flange adaptor (stub end)

SECTION 02401 – SANITARY SEWER PIPE

butt fused to the pipe, a backup flange ring, bolts, nuts and a gasket. Flange rings shall be Standard Steel Ring Flanges, Class D, in accordance with AWWA C207. High strength bolts, nuts, washers and gaskets shall be in conformance with AWWA C207, Appendix A. Flange rings, bolts, nuts and washers shall be hot dip galvanized after fabrication per ASTM A153 and A386. Gasket dimensions and bolt lengths shall be per pipe manufacturer's recommendations.

END OF SECTION

SECTION 02402 – SANITARY SEWER MANHOLES AND CLEANOUTS

PART 1 – GENERAL

1.1 DESCRIPTION

- A. The WORK under this Section includes providing all labor, materials, tools and equipment necessary for furnishing and installing sanitary sewer manholes and cleanouts complete, in place. It shall also include raising or lowering existing sanitary sewer manholes and cleanouts to conform to the final grade as shown on the Drawings and Standard Details.

1.2 SUBMITTALS

- A. Manholes: Shop Drawings showing method of construction and reinforcement, invert elevations, and overall dimensions.
- B. Frames and Grates: Catalogue cuts and materials certification.

PART 2 – PRODUCTS

2.1 MANHOLES

- A. All manholes shall consist of precast concrete sections, including integral base section, riser sections, cones, and flat slab tops and shall conform to ASTM C 478 and the dimensions shown on the Drawings. All precast sections shall have joints sealed with “RAM-NEK” or “RUB-R-NEK” gasketing material, or approved equal, installed as specified by the manufacturer. Cones shall be eccentric. Manhole steps shall be cast in all precast manhole sections. Pipe penetration gaskets shall be cast into all precast manholes. Grade rings shall be standard product, manufactured particularly for use in manhole construction, sized to fit the cones on which they are placed, and the wall thickness shall be not less than that of the cones. Grade rings shall be not less than two inches high, nor more than four inches high. Grade rings shall be *Infra-Riser*® or approved equal.
- B. Portland cement concrete cast in place shall conform to Section 03302 – Concrete Structures.

2.2 FRAMES, COVERS AND STEPS

- A. Manhole frames and covers shall be watertight, of ductile iron, and conform to the design and dimensions shown on the Drawings and Standard Details. Ductile iron castings shall conform to the requirements of AASHTO M 103. Grade shall be optional unless otherwise designated. Contact surfaces between frames and covers shall be machined to provide a uniform contact surface. When watertight locking devices are specified, the OWNER shall submit Shop Drawings for approval by the ENGINEER.
- B. All manhole covers shall have the word “SEWER” cast into the top in letters approximately three inches high.
- C. Manhole steps shall be constructed of polypropylene conforming to ASTM D4101, and shall meet current state and federal safety standards.

SECTION 02402 – SANITARY SEWER MANHOLES AND CLEANOUTS

- D. Frames and covers shall be ductile iron, conforming to ASTM A 48, Class 30. The cover shall be designed for the appropriate classification of traffic and shall have the word “SEWER” cast into the top with prominent letters. Bearing surfaces between the frame and cover shall be machined to smooth, plane surfaces. Frames and covers shall be Inland Foundry No. 743, or approved equal.

2.3 MISCELLANEOUS

- A. All pipes, bends and fittings used in cleanouts, drop connections, and pipe stubs for future connections to manholes shall conform to Section 02401 – Sanitary Sewer Pipe.
- B. Bentonite-Cement sealing plaster shall consist of two parts bentonite, one part Type 3 cement, and one part sand, with sufficient water to obtain workable consistency.
- C. Mortar shall consist of one part portland cement to two parts clean, well-graded sand which will pass a No. 4 screen. Admixtures may be used not exceeding the following percentages of weight of cement; hydrated lime, 10%; diatomaceous earth or other inert material, 5%. Consistency of mortar shall be such that it will readily adhere to the surface. Mortar mixed for longer than thirty minutes shall not be used. A non-shrink mortar may be submitted for approval as a substitute.
- D. Grout shall be a non-shrink type.
- E. Pipe penetration gasket through the manhole wall shall be cast-in-place Dura-Seal III, or approved equal, as manufactured by Dura-Tech, Inc., Kor-N-Seal Cavity O-Ring, or approved equal, as manufactured by NPC Inc. shall be used for filling the preformed void in the connection gasket.
- F. Manhole exterior joint waterproofing shall be a Miradri system as manufactured by Mirafi, Inc. including Miradri P-804 primer, Miradri 861 Membrane, and Miradri M-800 mastic, or approved equal that includes a membrane and adhesive system for positive water exclusion. The membrane shall extend at least 18” each side of manhole joints, except this width may be reduced to 9” each side of manhole joints if the joint is less than four feet below finished grade and the joint is above the maximum water table.

PART 3 – EXECUTION

3.1 CONSTRUCTION

- A. Manholes shall be constructed in a dry excavation on a six inch compacted (95%) base of D-1. The excavation shall be kept dry until the concrete or mortar has developed sufficient strength to prevent rupture by groundwater pressure.
- B. Manhole inverts shall be formed as shown on the Drawings, either by laying pipe through and cutting out the top portion before completion of the base of the manholes, or by forming U-shaped channels in the concrete base section. Cut edges of pipe laid through the manhole shall be fully covered by concrete when the manhole invert is complete. The finished invert shall be smooth and true to grade. No mortar or broken pieces of pipe shall be allowed to enter the sewers.
- C. Precast bases sections shall be set on a level base of six inches of compacted D-1, as shown in the Standard Details. Provisions shall be made to prevent flotation of the manhole.

SECTION 02402 – SANITARY SEWER MANHOLES AND CLEANOUTS

- D. All lifting holes shall be plugged with Bentonite-Cement sealing plaster and sealed with a Miradri System patch, or approved equal, to a minimum of six inches from the edges of the opening, as required to prevent leakage.
- E. After completion of the manhole, all plugs shall be completely removed from the sewers and all loose material shall be removed from the manhole.
- F. Service connections shall not be installed into manholes unless otherwise shown on the Drawings. Where service connections into manholes are allowed, the top of the service sewer pipe shall be 0.2 feet higher than the top of the downstream main sewer pipe. The manhole invert shall be channeled for the service connection sewers in the same manner as for main sewers.
- G. Stubs for future construction shall consist of a section of pipe extending two feet outside the manhole wall, connected as shown on the Drawings and Standard Details. The manhole fillet shall be formed for future connection. The stubs shall be located as shown on the Drawings.
- G. Connection to existing manholes shall be made in such a manner that the modified manhole is equal to a new manhole in appearance and performance. A channel, approximately two inches larger all around than the connecting pipe, shall be cut into the existing manhole base. The new pipe shall be connected as shown on the Drawings and Standard Details. The rough-cut channel shall be finished to its final smooth and uniform shape with mortar. The existing sewer(s) shall be maintained in service and the fresh concrete and mortar surface shall be protected from the flowing sewage for a minimum of 24 hours.
- I. Drop construction at manholes shall be as shown on the Drawings and Standard Details.
- J. The joint exterior waterproofing system shall be installed as recommended by the system manufacturer and as shown on the Drawings and Standard Details.
- K. All manholes will be visually inspected. There shall be no evidence of leakage of water into any manhole from outside sources or any imperfections which may allow such leakage.
- L. Cleanouts shall be constructed as shown on the Drawings and Standard Details. The frame shall be jointed to the riser pipe so that groundwater will be prevented from entering the sewer. Cleanouts shall be tested for watertightness along with the sewers to which they are connected.
- M. The OWNER shall repair all imperfections and leaks disclosed by either visual inspection or testing.
- N. ADJUST EXISTING FRAME AND COVER TO GRADE shall include adjusting the existing frame and cover to grade, and construction of a concrete collar in accordance with Standard Detail 126 – Concrete Collar, when the frame and cover is located within the paved street surface.

3.2 CONNECT TO EXISTING MANHOLE

- A. OWNER shall remove or plug existing pipe as applicable, drill hole at new location required for installation of sewer under this contract, install pipe, seal the pipe penetration, form channeled inverts, install drop connections as required, and backfill as require.

SECTION 02402 – SANITARY SEWER MANHOLES AND CLEANOUTS

END OF SECTION

SECTION 02702 - CONSTRUCTION SURVEYING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The WORK under this Section includes providing all labor, materials, tools and equipment necessary to perform all surveying and staking necessary for the completion of the project in conformance with the plans and specifications, including all calculations required to accomplish the work.
- B. The WORK shall include the staking, referencing and all other actions as may be required to preserve or restore land monuments and property corners which are situated within the project area, and to establish monuments as shown on the plans.
- C. The WORK also includes providing two measurements (swing ties) for each curb stops and all mainline valves to permanent structures such as house corners or fire hydrants.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 CONSTRUCTION

- A. All surveying involving property lines or monuments shall be done by, or under the direction of, a Registered Land Surveyor licensed to practice in the State of Alaska.
- B. The OWNER will supply information relative to the approximate locations of monuments and corners, but final responsibility for locations, referencing, and restoration shall rest with the CONTRACTOR.
- C. In the event the CONTRACTOR does not replace the survey monuments and property corners disturbed by the CONTRACTOR's operations, the OWNER may, after first notifying the CONTRACTOR, replace the monuments in question and the cost of such replacements shall be deducted from payments to the CONTRACTOR.
- D. The CONTRACTOR shall provide the OWNER with a copy of all surveyor's notes, prior to the request for final payment, and include the information on the record drawings.
- E. The CONTRACTOR shall obtain all information necessary for as-built plan production, from actual measurements and observations made by his own work force, including subcontractors, and submit this information to the OWNER. As-built locations shall be provided for all valves, water services, sewer services, fire hydrants etc.
- F. The CONTRACTOR shall use competent, qualified personnel and suitable equipment for the layout work required and shall furnish all stakes, templates, straightedges and other devices necessary for establishing, checking and maintaining the required points, lines and grades.
- G. The CONTRACTOR shall perform all staking necessary to delineate clearing and/or grubbing limits; all cross sections necessary for determination of excavation and embankment quantities, including intermediate and/or remeasure cross sections as may be required; all slope staking; all staking of culverts and drainage structures, including the necessary checking

SECTION 02702 - CONSTRUCTION SURVEYING

to establish the proper location and grade to best fit the conditions on site; the setting of such finishing stakes as may be required; the staking of right-of-way; the staking, referencing and other actions as may be required to preserve or restore land monuments and property corners; and all other staking necessary to complete the project.

END OF SECTION

SECTION 03301 - STRUCTURAL CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The WORK under this Section includes providing all labor, materials, tools and equipment necessary for furnishing and installing portland cement concrete for structures in conformance with the Plans and Specifications.

PART 2 - PRODUCTS

2.1 PORTLAND CEMENT

- A. Portland cement shall conform to the requirements of AASHTO M 85.
- B. Unless otherwise permitted by the OWNER, the product of only one mill of any one brand and type of portland cement shall be used on the project.

2.2 FINE AGGREGATE

- A. Fine aggregate for portland cement concrete shall conform to the requirements of AASHTO M 6 with the following exceptions:

Delete section on deleterious substances and substitute the following:

The amount of deleterious substances shall not exceed the following limits:

- Friable particles percent by weight..... 5 max.
- Coal and Lignite, percent by weight using a liquid of 1.95 specific gravity (only material that is brownish-black shall be considered as coal or lignite) 0.5 max.
- Material passing the No. 200 sieve, percent by weight 3.0 max.

Delete paragraph 4.2 of AASHTO M 6.

2.3 COARSE AGGREGATE

- A. Coarse aggregate for portland cement concrete shall conform to the requirements of AASHTO M 80, Class A, with the following exceptions:

Delete section on deleterious substances and substitute the following:

The amount of deleterious substances shall not exceed the following limits:

- Coal and Lignite, percent by weight (only material that is brownish-black or black shall be considered coal or lignite) 1.0 max.
- Material passing the No. 200 sieve..... 1.0 max.
- Thin-elongated pieces, percent by weight. (Length greater than 5 times average thickness) 5 max.
- Sticks and roots, percent by weight 0.10 max.
- Friable Particles, percent by weight 0.25 max.
- Maximum loss from AASHTO T 96 shall be 50 percent.

SECTION 03301 - STRUCTURAL CONCRETE

Maximum loss from AASHTO T 104 shall be 12 percent.

Add the following: AASHTO T-104 shall be performed using sodium sulfate solution.

2.4 JOINT FILLERS

A. Joint filler, of the type designated in the Contract, shall conform to the following:

1. Poured filler shall conform to AASHTO M 173 or AASHTO M 282 as specified.
2. Preformed fillers shall conform to AASHTO M 33 for bituminous type; AASHTO M 153 for sponge rubber (type I), cork (type II), and self-expanding cork (type III); AASHTO M 213 for nonextruding and resilient bituminous types and
3. AASHTO M 220 for preformed elastomeric types as specified. The filler shall be punched to admit the dowels where called for on the Plans. Joint filler shall be furnished in a single piece for the depth and width required for the joint unless otherwise authorized by the OWNER. When more than one piece is authorized for a joint, the abutting ends shall be fastened securely, and held accurately to shape, by stapling or other positive fastening satisfactory to the OWNER.
4. Foam filler shall be expanded polystyrene filler having a compressive strength of not less than 10 psi.
5. Hot-poured sealants for concrete and asphaltic pavements shall conform to ASTM D 3405.
6. Hot-poured elastomeric type sealant for concrete pavements shall conform to ASTM D 3406.
7. Cold-poured silicone type sealant for concrete pavements shall conform to Federal Specification TT-S-1543, Class A. The sealant shall be a one part, low-modulus silicone rubber with an ultimate elongation of 1,200 percent.

2.5 CURING MATERIAL

A. Curing material shall conform to the following requirements as specified:

1. Burlap Cloth made from Jute Kenaf AASHTO M 182
2. Sheet Material for Curing Concrete AASHTO M 171
3. Liquid Membrane-Forming Compounds AASHTO M 148 for Curing Concrete, Type I

B. The requirements specified in AASHTO M 148 covering "Liquid Membrane-Forming Compounds for Curing Concrete" are modified by adding the following:

Liquid membrane-forming compounds utilizing linseed oil shall not be used.

SECTION 03301 - STRUCTURAL CONCRETE

2.6 AIR ENTRAINING AGENTS

- A. Air-entraining admixtures shall conform to the requirements of AASHTO M 154.

2.7 MIXING WATER

- A. Unless otherwise permitted in writing by the OWNER, all water shall be obtained from the a potable water system.

2.8 REINFORCING STEEL

- A. Reinforcing shall conform to AASHTO M 31, and be Grade 60.

2.9 SHIPPING AND STORAGE OF CEMENT

- A. Cement may be shipped from pretested approved bins. The cement shall be well protected from rain and moisture, and any cement damaged by moisture or which fails to meet any of the specified requirements shall be rejected and removed from the work.
- B. Cement stored by the CONTRACTOR for a period longer than 60 days in other than sealed bins or silos shall be retested before being used. Cement of different brands, types, or from different mills shall be stored separately.

2.10 COMPOSITION OF CONCRETE

- A. All portland cement concrete shall be ready-mix, provided by an approved plant regularly engaged in the production of concrete, unless otherwise authorized in writing by the OWNER. Ready-mix concrete shall conform to the requirements of AASHTO M 157.
- B. The CONTRACTOR shall furnish the design mix to the OWNER for approval. The mix design shall be suitable for its intended use. Concrete shall be designed using an absolute volume analysis. The CONTRACTOR shall be responsible for having each mix laboratory tested. Prior to the start of production of any mix design, the CONTRACTOR shall submit test results and certifications for all materials, detailed mix design data and results of laboratory tests to the OWNER for approval. Approval by the OWNER will be based on apparent conformity to these specifications. It shall remain the CONTRACTOR's responsibility during production to produce concrete conforming to the mix design and the minimum acceptance criteria in the contract. When requested by the OWNER, the CONTRACTOR shall submit samples of all materials for verification testing. Production shall not commence until the mix design is approved by the OWNER.
- C. Unless otherwise specified the design mix shall meet the following:

Minimum cement content	6 1/2 sacks (611 lb.) per C.Y.
Maximum water/cement ratio	5.75 gal/sack (0.51 #/#)
28-day compressive strength (f'c)	3,000 psi minimum
Slump	3" ± 1"
Entrained Air	3 to 6%
Coarse Aggregate	AASHTO M 43, Gradation No. 67

Note: Cement factors are based on 94-pound sacks

SECTION 03301 - STRUCTURAL CONCRETE

- D. The CONTRACTOR shall be responsible for producing and placing specification concrete with a cement content within a tolerance of 2%.
- E. The use of superplasticizers in the concrete mix to improve the workability of mixes with low water cement ratios will require prior written approval by the OWNER.
- F. The CONTRACTOR may, subject to prior approval in writing, use alternative sizes of coarse aggregate as shown in Table 1 of AASHTO M 43. If the use of an alternative size of coarse aggregate produces concrete which exceeds the permissible water-cement ratio above, thereby requiring additional cement above that specified, no compensation will be made to the CONTRACTOR for the additional cement.

2.11 SAMPLING AND TESTING

- A. Field tests of all materials will be made by the OWNER when deemed necessary, in accordance with the applicable Specifications. When the results of the field tests indicate the material does not conform to the requirements of the specifications, the re-tests required by the OWNER shall be at the expense of the CONTRACTOR.
- B. Materials which fail to meet contract requirements, as indicated by laboratory tests, shall not be used in the work. The CONTRACTOR shall remove all defective materials from the site.
- C. Types and sizes of concrete specimens shall be in accordance with ASTM C 31. Additional slump tests and/or test cylinders may be required at the discretion of the OWNER. Should the analysis of any test cylinder not meet the preceding requirements of Article 2.8, its representative concrete shall be removed and replaced at the CONTRACTOR's expense.
- D. Three copies of all test reports shall be furnished to the OWNER.

2.12 COLD WEATHER CONCRETE

- A. Concrete shall not be placed when the descending air temperature in the shade, away from artificial heat, falls below 40°F. nor resumed before the ascending air temperature reaches 35°F., without specific written authorization. When the air temperature falls below 40°F., or is, in the opinion of the OWNER, likely to do so within a 24 hour period after placing concrete, the CONTRACTOR shall have ready on the job materials and equipment required to heat mixing water and aggregate and to protect freshly placed concrete from freezing.
- B. Concrete placed at air temperatures below 40°F. shall have a temperature not less than 50°F. nor greater than 70°F. when placed in the forms. These temperatures shall be obtained by heating the mixing water and/or aggregate. Mixing water shall not be heated to more than 160°F.
- C. Binned aggregates containing ice or in a frozen condition will not be permitted nor will aggregates which have been heated directly by gas or oil flame or heated on sheet metal over an open fire. When aggregates are heated in bins, only steam-coil or water-coil heating will be permitted, except that other methods, when approved, may be used. If live steam is used to thaw frozen aggregate piles, drainage times comparable to those applicable for washed aggregates shall apply.

SECTION 03301 - STRUCTURAL CONCRETE

- D. When the temperature of either the water or aggregate exceeds 100°F, they shall be mixed together so that the temperature of the mix does not exceed 80°F at the time the cement is added.
- E. Any additives must have prior approval of the OWNER before being used.
- F. The use of calcium chloride is prohibited.
- G. When placing concrete in cold weather, the following precautions shall be taken in addition to the above requirements:
- H. Heat shall be applied to forms and reinforcing steel before placing concrete as required to remove all frost, ice, and snow from all surfaces which will be in contact with fresh concrete.
- I. When fresh concrete is to be placed in contact with hardened concrete, the surface of the previous pour shall be warmed to at least 35°F., thoroughly wet, and free water removed before fresh concrete is placed.
- J. Freshly placed concrete shall be maintained at a temperature of not less than 70°F. for 3 days or not less than 50°F. for 5 days, when Type I or II cement is used, and not less than 70°F. for 2 days or not less than 50°F. for 3 days, when Type III cement is used. The above requirements are not intended to apply during the normal summer construction season when air temperatures of 40°F. or higher can reasonably be anticipated during the two-week period immediately following concrete placement, or until the concrete is no longer in danger from freezing.
- K. When temperatures below 20°F. are not expected during the curing period and, in the opinion of the OWNER, no other adverse conditions, such as high winds, are expected, concrete temperatures may be maintained in thick concrete sections by retention of heat of hydration by means of adequately insulated forms.
- L. When, in the opinion of the OWNER, greater protection is required to maintain the specified temperature, the fresh concrete shall be completely enclosed and an adequate heat source provided. Such enclosure and heat source shall be so designed that evaporation of moisture from the concrete during curing is prevented. Precautions shall be taken to protect the structure from overheating and fire.
- M. At the end of the required curing period protection may be removed, but in such a manner that the drop in temperature of any portion of the concrete will be gradual and not exceed 30°F. in the first 24 hours.
- N. For concrete placed within cofferdams and cured by flooding with water, the above conditions may be waived provided that the water in contact with the concrete is not permitted to freeze. De-watering shall not be carried out until the OWNER determines that the concrete has cured sufficiently to withstand freezing temperatures and hydrostatic pressure.
- O. The CONTRACTOR shall be wholly responsible for the protection of the concrete during cold weather operations. Any concrete injured by frost action or overheating shall be removed and replaced at the CONTRACTOR's expense.

SECTION 03301 - STRUCTURAL CONCRETE

2.13 FORMS

- A. Forms shall be so designed and constructed that they may be removed without injuring the concrete.
- B. Unless otherwise specified, forms for exposed surfaces shall be made of plywood, hard-pressed fiberboard, sized and dressed tongue-and-groove lumber, or metal in which all bolt and rivet holes are countersunk, so that a plane, smooth surface of the desired contour is obtained. Rough lumber may be used for surfaces that will not be exposed in the finished structure. All lumber shall be free from knotholes, loose knots, cracks, splits, warps, or other defects affecting the strength or appearance of the finished structure. All forms shall be mortar tight, free of bulge and warp, and shall be cleaned thoroughly before reuse.
- C. In designing forms and falsework, concrete shall be regarded as a liquid. In computing vertical loads a weight of 150 pounds per cubic foot shall be assumed. The lateral pressure for design of wall forms shall not be less than that given by the following formulas:

For walls with R not exceeding 7 feet per hour:

$$P = 150 + \frac{9000R}{T}, \text{ but not more than}$$

2000 p.s.f. or 150 h, whichever is less.

For walls with R greater than 7 feet per hour:

$$P = 150 + \frac{43,400}{T} + \frac{2800R}{T}, \text{ but not more}$$

than 2000 p.s.f. or 150 h, whichever is less.

Where:

P = lateral pressure for design of wall forms, p.s.f.

R = rate of placement, feet per hour

T = temperature of concrete in forms, °F

h = maximum height of fresh concrete in form, feet

- D. The above formulas apply to internally vibrated concrete placed at 10 feet per hour or less, without the use of retarding agents, and where depth of vibration is limited to 4 feet below the top of the concrete surface. The CONTRACTOR shall state the placement rate and minimum concrete temperature on the working drawings for concrete form work. Deflection of plywood, studs, and walers shall not exceed 1/360 of the span between supports.
- E. Forms shall be so designed that placement and finishing of the concrete will not impose loads on the structure resulting in adverse deflections or distortions.

SECTION 03301 - STRUCTURAL CONCRETE

- F. The forms shall be so designed that portions covering concrete that is required to be finished may be removed without disturbing other portions that are to be removed later. As far as practicable, form marks shall conform to the general lines of the structure.
- G. When possible, forms shall be day-lighted at intervals not greater than 10 feet vertically, the openings being sufficient to permit free access to the forms for the purpose of inspecting, and working.
- H. Metal ties or anchorages within the forms shall be so constructed as to permit their removal to a depth of at least 1 inch from the face without injury to the concrete. All fittings for metal ties shall be of such design that, upon their removal, the cavities which are left will be of the smallest possible size.
- I. All exposed edges 90° or sharper shall be chamfered 3/4 inch unless otherwise noted. Chamfering of forms for re-entrant angles shall be required only when specifically indicated on the Plans.
- J. Forms shall be inspected immediately prior to the placing of concrete. Dimensions shall be checked carefully and any bulging or warping shall be remedied and all debris and standing water within the forms shall be removed. Special attention shall be paid to ties and bracing and where forms appear to be braced insufficiently or built unsatisfactorily, either before or during placing of the concrete, the OWNER shall order the work stopped until the defects have been corrected.
- K. Forms shall be constructed true to line and grade. Clean-out ports shall be provided at construction joints.
- L. The construction of concrete slabs with permanent steel forms shall conform to the requirements of this specification and as shown on the Plans. Removable forms may be substituted for permanent metal forms with no adjustment in prices.
- M. All forms shall be installed in accordance with approved fabrication and erection plans.
- N. Form sheets shall not be permitted to rest directly on the top of the stringer or floor beam flanges. Sheets shall be securely fastened to form supports and shall have a minimum bearing one inch in length at each end. Form supports shall be placed in direct contact with the flange or stringer or floor beam. All attachments shall be made by permissible welds, bolts, clips or other approved means.
- O. All porous forms shall be treated with non-staining form oil or saturated with water immediately before placing concrete.
- P. Falsework shall be built to carry the loads without appreciable settlement. Falsework that cannot be founded on solid footings must be supported by ample falsework piling. Falsework shall be designed to sustain all imposed loads.
- Q. Detail drawings of the falsework shall be submitted for review, but such review shall not relieve the CONTRACTOR of any responsibility under the contract for the successful completion of the structure.

SECTION 03301 - STRUCTURAL CONCRETE

- R. Forms and falsework shall not be removed without the consent of the OWNER. The OWNER's consent shall not relieve the CONTRACTOR of responsibility for the safety of the work. Blocks and bracing shall be removed at the time the forms are removed and in no case shall any portion of the wood forms be left in the concrete.
- S. To facilitate finishing, forms used on ornamental work, railings, parapets, and exposed vertical surfaces shall be removed in not less than 12 nor more than 48 hours, depending upon weather conditions. The side forms for arch rings, columns, and piers shall be removed before the members of the structure which they support are placed, so that the quality of the concrete may be inspected. All such side forms shall be removed before the removal of shoring from beneath beams and girders.
- T. In warm weather, falsework and forms shall remain in place under slabs, beams, girders and arches for 14 days after the day of last pour when Type I or Type II cement is used, or for 7 days when Type III cement is used. Forms for slabs having clear spans or cantilever spans of less than 10 feet may be removed after 7 days when Type I or Type II cement is used, or after 4 days when Type III cement is used. In cold weather, the length of time that forms and falsework are to remain in place shall be as approved.
- U. Falsework supporting the deck of rigid frame structures shall not be removed until fills have been placed behind the vertical legs.
- V. No superstructure load shall be placed upon finished concrete until the OWNER so directs, but the minimum time allowed for the curing of structural concrete in the substructure before any load of the superstructure is placed thereon shall be 7 days when Type I or Type II cement is used and 2 days when Type III cement is used.

PART 3 - EXECUTION

3.1 GENERAL

- A. All concrete shall be placed before it has taken its initial set and, in any case, within 30 minutes after mixing. Concrete shall be placed in such manner as to avoid segregation of coarse or fine portions of the mixture, and shall be spread in horizontal layers when practicable. Special care shall be exercised in the bottom of slabs and girders to assure the working of the concrete around nests of reinforcing steel, so as to eliminate rock pockets or air bubbles. Enough rods, spades, tampers and vibrators shall be provided to compact each batch before the succeeding one is dumped and to prevent the formation of joints between batches.
- B. Extra vibrating shall be done along all faces to obtain smooth surfaces. Care shall be taken to prevent mortar from splattering on forms and reinforcing steel and from drying ahead of the final covering with concrete.
- C. Concrete shall not be placed in slabs or other sections requiring finishing on the top surface when precipitation is occurring or when in the opinion of the OWNER precipitation is likely before completion of the finishing, unless the CONTRACTOR shall have ready on the job all materials and equipment necessary to protect the concrete and allow finishing operations to be completed.

SECTION 03301 - STRUCTURAL CONCRETE

- D. Troughs, pipes, or short chutes used as aids in placing concrete shall be arranged and used in such a manner that the ingredients of the concrete do not become separated. Where steep slopes are required, troughs and chutes shall be equipped with baffle boards or shall be in short lengths that reverse the direction of movement. All chutes, troughs, and pipe shall be kept clean and free of hardened concrete by flushing thoroughly with water after each run. Water used for flushing shall be discharged clear of the concrete in place. Troughs and chutes shall be of steel or plastic or shall be lined with steel or plastic and shall extend as nearly as possible to the point of deposit. The use of aluminum for pipes, chutes or tremies is prohibited. When discharge must be intermittent, a hopper or other device for regulating the discharge shall be provided.
- E. Dropping the concrete a distance of more than 5 feet or depositing a large quantity at any point and running or working it along the forms will not be permitted. The placing of concrete shall be so regulated that the pressures caused by wet concrete shall not exceed those used in the design of the forms.
- F. High frequency internal vibrators of either the pneumatic, electrical, or hydraulic type shall be used for compacting concrete in all structures. The number of vibrators used shall be ample to consolidate the fresh concrete within 15 minutes of placing in the forms. In all cases, the CONTRACTOR shall provide at least 2 concrete vibrators for each individual placement operation (1 may be a standby), which shall conform to the requirements of these specifications. Prior to the placement of any concrete, the CONTRACTOR shall demonstrate that the 2 vibrators are in good working order and repair and ready for use.
- G. The vibrators shall be an approved type, with a minimum frequency of 5,000 cycles per minute and shall be capable of visibly affecting a properly designed mixture with a 1 inch slump for a distance of at least 18 inches from the vibrator.
- H. Vibrators shall not be held against forms or reinforcing steel nor shall they be used for flowing the concrete or spreading it into place. Vibrators shall be so manipulated as to produce concrete that is free of voids, is of proper texture on exposed faces, and of maximum consolidation. Vibrators shall not be held so long in one place as to result in segregation of concrete or formation of laitance on the surface.
- I. Concrete shall be placed continuously throughout each section of the structure or between indicated joints. If, in an emergency, it is necessary to stop placing concrete before a section is completed, bulkheads shall be placed as the OWNER may direct and the resulting joint shall be treated as a construction joint.
- J. The presence of areas of excessive honeycomb may be considered sufficient cause for rejection of a structure. Upon written notice that a given structure has been rejected, the rejected work shall be removed and rebuilt, in part or wholly as specified, at the CONTRACTOR's expense.

3.2 PUMPING CONCRETE

- A. Concrete may be placed by pumping provided the CONTRACTOR demonstrates that the pumping equipment to be used will effectively handle the particular class of concrete with the slump and air content specified and that it is so arranged that no vibrations result that might

SECTION 03301 - STRUCTURAL CONCRETE

damage freshly placed concrete. The operation of the pump shall be such that a continuous stream of concrete without air pockets is produced.

- B. When pumping is completed, the concrete remaining in the pipeline, if it is to be used, shall be ejected in such a manner that there will be no contamination of the concrete or separation of the ingredients. After this operation, the entire equipment shall be thoroughly cleaned. Slump tests shall be taken at the discharge end of the pipe.

3.3 CONSTRUCTION JOINTS

- A. Construction joints shall be located where shown on the Plans or as permitted by the OWNER. Construction joints shall be perpendicular to the principal lines of stress and in general shall be located at points of minimum shear.
- B. At horizontal construction joints, gage strips 1-1/2 inches thick shall be placed inside the forms along all exposed faces to give the joints straight lines. Before placing fresh concrete, the surfaces of construction joints shall be washed and scrubbed with a wire broom, drenched with water until saturated, and kept saturated until the new concrete is placed.
- C. Immediately prior to placing new concrete the forms shall be drawn tight against the concrete already in place. Concrete in substructures shall be placed in such manner that all horizontal construction joints will be truly horizontal and, if possible, in locations such that they will not be exposed to view in the finished structure. Where vertical construction joints are necessary, reinforcing bars shall extend across the joint in such a manner as to make the structure monolithic. Special care shall be taken to avoid construction joints through large surfaces which are to be treated architecturally.
- D. All construction joints shall be provided with concrete shear keys at least 1-1/2 inches deep and 1/3 of the concrete thickness in width, unless otherwise shown on the Plans.

3.4 ANCHOR BOLTS

- A. Anchor bolt assemblies conforming to the details shown shall be accurately secured in the forms in the positions shown on the Plans, before any concrete is placed in the forms. The positions shall be checked and any adjustments made as soon as the concrete has been placed.
- B. When pipe sleeves or pre-cast holes are provided, no water shall be allowed to freeze in the cavity. If frost causes cracks in the concrete, the entire placement shall be removed and replaced at the CONTRACTOR's expense. When anchor bolts are installed in pipe sleeves or pre-cast holes, the cavity shall be completely filled with grout at the time the grout pads are constructed or at the time the bearing assemblies or masonry plates are placed.

3.5 PIPES, CONDUITS, AND DUCTS

- A. Pipes, conduits, and ducts that are to be encased in concrete shall be installed in the forms by the CONTRACTOR before the concrete is placed. Unless otherwise indicated, they shall be standard, lightweight cast-iron water pipe or wrought iron. They shall be held rigidly so they will not be displaced during concrete placement.

SECTION 03301 - STRUCTURAL CONCRETE

3.6 STEM WALL FINISH

- A. An Stem Wall Finish is defined as the finish left on a surface after the removal of the forms, the filling of all holes left by form ties, and the repairing of all defects. The surface shall be true and even, free from stone pockets and depressions or projections. All surfaces that cannot be satisfactorily repaired shall be given a Rubbed Finish.
- B. The concrete in caps and tops of walls shall be struck off with a straightedge and floated to true grade. The use of mortar topping for concrete surfaces shall in no case be permitted.
- C. As soon as the forms are removed, metal devices that have been used for holding the forms in place, and which pass through the body of the concrete, shall be removed or cut back at least 1 inch beneath the surface of the concrete. Fins of mortar and all irregularities caused by form joints shall be removed.
- D. All small holes, depressions, and voids, that show upon the removal of forms, shall be filled with cement mortar mixed in the same proportions as that used in the body of the work. In patching larger holes and honeycombs, all coarse or broken material shall be chipped away until a dense uniform surface of concrete exposing solid coarse aggregate is obtained. Feathered edges shall be cut away to form faces perpendicular to the surface. All surfaces of the cavity shall be saturated thoroughly with water, after which a thin layer of neat cement mortar shall be applied. The cavity shall then be filled with stiff mortar composed of one part portland cement to two parts sand, which shall be thoroughly tamped into place. The mortar shall be pre-shrunk by mixing it approximately 20 minutes before using. The length of time may be varied in accordance with brand of cement used, temperature, humidity, and other local conditions. The surface of this mortar shall be floated with a wooden float before initial set takes place and shall be neat in appearance. The patch shall be kept wet for a period of five days.
- E. For patching large or deep areas, coarse aggregate shall be added to the patching material. All mortar for patching on surfaces which will be exposed to view in the completed structure shall be color matched to the concrete. Test patches for color matching shall be conducted on concrete that will be hidden from view in the completed work and shall be subject to approval.

3.7 SLAB FINISH

- A. After vibration and tamping during placement of concrete, leveling and screeding shall be done to produce an even uniform surface.
- B. After sufficient stiffening of the screeded concrete, surfaces shall be float finished with wood or metal floats or with a finishing machine using float blades. Excessive floating of surfaces while the concrete is plastic and dusting of dry cement and sand on the concrete surface to absorb excess moisture will not be permitted. Floating shall be the minimum necessary to produce a surface that is free from screen marks and is uniform in texture.
- C. After the floated surface has hardened sufficiently to prevent excess fine material from being drawn to the surface, steel troweling shall be performed with firm pressure such as will flatten the sandy texture of the floated surface and produce a dense, uniform surface free from

SECTION 03301 - STRUCTURAL CONCRETE

blemishes, ripples and trowel marks. The finish shall be smooth and free from all irregularities.

3.8 CURING CONCRETE

A. Water Curing:

1. All concrete surfaces shall be kept wet for at least seven days after placing if Type I or II cement has been used or for three days if Type III cement has been used. Concrete shall be covered with wet burlap, cotton mats, or other materials meeting the requirements of AASHTO M 171 immediately after final finishing of the surface. These materials shall remain in place for the full curing period or they may be removed when the concrete has hardened sufficiently to prevent marring and the surface immediately covered with sand, earth, straw, or similar materials.
2. In either case the materials shall be kept thoroughly wet for the entire curing period. All other surfaces, if not protected by forms, shall be kept thoroughly wet, either by sprinkling or by the use of wet burlap, cotton mats, or other suitable fabric, until the end of the curing period. If wood forms are allowed to remain in place during the curing period, they shall be kept moist at all times to prevent opening at joints.

- B. Membrane Curing. Liquid membrane curing compound meeting the requirements of AASHTO M 148, Type I, may be permitted, subject to approval by the OWNER, except compounds utilizing linseed oil shall not be used. All finishing of concrete surfaces shall be performed to the satisfaction of the OWNER prior to applying the impervious membrane curing compound. The concrete surfaces must be kept wet with water continuously until the membrane has been applied. The manufacturer's instructions shall be carefully followed in applying the membrane, and in all cases the membrane curing compound must always be thoroughly mixed immediately before application. In case the membrane becomes marred, worn, or in any way damaged, it must immediately be repaired by wetting the damaged area thoroughly and applying a new coat of the impervious membrane curing compound. Membrane curing will not be permitted for concrete slabs that are to be covered with waterproof membranes, polymer modified concrete or at construction joints.

3.9 CLEANING UP

- A. Upon completion of the structure and before final acceptance, the CONTRACTOR shall remove all formwork and surplus concrete.

END OF SECTION

SECTION 11000 - EQUIPMENT GENERAL PROVISIONS

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall provide all tools, supplies, materials, equipment, and all labor necessary for the furnishing, construction, installation, testing, and operation of all equipment and appurtenant work, complete and operable, all in accordance with the requirements of the Contract Documents.
- B. The provisions of this Section shall apply to all equipment specified and where referred to, except where otherwise specified or shown.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300 Contractor Submittals.
- B. Divisions 2, 9, 11, 15 and 16 as applicable.

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. **Codes:** All codes, as referenced herein, are specified in Section 01090 "Reference Standards."
- B. **Commercial Standards:** All equipment, products, and their installation shall be in accordance with the following standards, as applicable, and as specified in each Section of these specifications:
 - 1. American Society for Testing and Materials (ASTM).
 - 2. American Public Health Association (APHA).
 - 3. American National Standards Institute (ANSI).
 - 4. American Society of Mechanical Engineers (ASME).
 - 5. American Water Works Association (AWWA).
 - 6. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE).
 - 7. American Welding Society (AWS).
 - 8. National Fire Protection Association (NFPA).
 - 9. Federal Specifications (FS).
 - 10. National Electrical Manufacturers Association (NEMA).
 - 11. Manufacturer's published recommendations and specifications.
 - 12. General Industry Safety Orders (OSHA).

The following standards have been referred to in this Section of the specifications:

ANSI B16.1	Cast Iron Pipe Flanges and Flanged Fittings Class 25, 125, 250, and 800.
ANSI B16.5	Pipe Flanges and Flanged Fittings, Steel, Nickel Alloy, and Other Special Alloys.

SECTION 11000 - EQUIPMENT GENERAL PROVISIONS

ANSI B46.1	Surface Texture.
ANSI S12.6	Method for the Measurement of the Real-Ear Attenuation of Hearing Protectors.
ANSI/ASME B1.20.1	General Purpose Pipe Threads (Inch).
ANSI/ASME B31.1	Power Piping.
ANSI/AWWA D100	Welded Steel Tanks for Water Storage.
AWWA C206	Field Welding of Steel Water Pipe.
ASTM A 48	Specification for Gray Iron Castings.
ASTM A 108	Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality.

1.4 CONTRACTOR SUBMITTALS

- A. **Shop Drawings:** The CONTRACTOR shall furnish complete Shop Drawings for all equipment specified in the various Sections, together with all piping, valves, and controls for review by the ENGINEER in accordance with Section 01300 "Contractor Submittals."
- B. **Tools:** The CONTRACTOR shall supply one complete set of special wrenches or other special tools necessary for the assembly, adjustment, and dismantling of the equipment. All tools shall be of best quality hardened steel forgings with bright, finished heads and with work faces dressed to fit nuts. The set of tools shall be neatly mounted in a labeled tool box of suitable design provided with a hinged cover.
- C. **Spare Parts:** The CONTRACTOR shall obtain and submit from the manufacturer a list of suggested spare parts for each piece of equipment. After approval, CONTRACTOR shall furnish such spare parts suitably packaged, identified with the equipment number, and labeled. CONTRACTOR shall also furnish the name, address, and telephone number of the nearest distributor for each piece of equipment. All spare parts are intended for use by the OWNER, only, after expiration of the warranty period.
- D. **Torsional Analysis:** The CONTRACTOR shall submit to the ENGINEER a torsional and lateral vibration analysis of the following equipment, in accordance with Section 01300 "Contractor Submittals." The analysis has to be performed by a specialist experienced in this type of work and approved by the ENGINEER.
1. All engine drives.
 2. All blowers and compressors with drives of 100 horsepower and over.
 3. All vertical pumps with universal joints and extended shafts.
 4. All other equipment where specified.

SECTION 11000 - EQUIPMENT GENERAL PROVISIONS

The torsional natural frequency of the drive train must be avoided by +/- 25 percent by any exciting frequency of the equipment, throughout the entire operating range.

- E. **Vibration Analysis:** In his bid price the CONTRACTOR shall include at least two site visits of the abovementioned specialist, during construction and testing of the equipment, to analyze and measure the amount of equipment vibration and submit his written recommendation for keeping the vibration at a safe limit.

1.5 QUALITY ASSURANCE

- A. **Inspection, Startup, and Field Adjustment:** The CONTRACTOR shall demonstrate that all equipment meets the specified performance requirements. CONTRACTOR shall provide the services of an experienced, competent, and authorized service representative of the manufacturer of each item of major equipment who shall visit the site of Work to perform the following tasks:
1. Assist the CONTRACTOR in the installation of the equipment.
 2. To inspect, check, adjust if necessary and approve the equipment installation.
 3. To start-up and field-test the equipment for proper operation, efficiency, and capacity.
 4. To perform necessary field adjustments during the test period until the equipment installation and operation are satisfactory to the ENGINEER.
 5. To instruct the OWNER's personnel in the operation and maintenance of the equipment. Instruction shall include step-by-step trouble shooting procedures with all necessary test equipment.
- B. **Costs:** The costs of all inspection, startup, testing, adjustment, and instruction work performed by said factory-trained representatives shall be borne by the CONTRACTOR. When available, the OWNER'S operating personnel will provide assistance in the field testing.
- C. **Public Inspection:** It shall be the responsibility of the CONTRACTOR to inform the local authorities, such as building and plumbing inspectors, fire marshall, OSHA inspectors, and others, to witness all required tests for piping, plumbing, fire protection systems, pressure vessels, safety systems, etc., to obtain all required permits and certificates, and pay all fees.
- D. **Tolerances:** Tolerances and clearances shall be as shown on the Shop Drawings and shall be closely adhered to. Machine work shall in all cases be of high-grade workmanship and finish, with due consideration to the special nature or function of the parts. Members without milled ends and which are to be framed to other steel parts of the structure may have a variation in the detailed length of not greater than 1/16-inch for members 30 feet or less in length, and not greater than 1/8-inch for members over 30 feet in length.
- E. **Machine Finish:** The type of finish shall be the most suitable for the application and shall be shown in micro-inches in accordance with ANSI B46.1. The following finishes shall be used:

SECTION 11000 - EQUIPMENT GENERAL PROVISIONS

1. Surface roughness not greater than 63 micro-inches shall be required for all surfaces in sliding contact.
2. Surface roughness not greater than 250 micro-inches shall be required for surfaces in contact where a tight joint is not required.
3. Rough finish not greater than 500 micro-inches shall be required for other machined surfaces.
4. Contact surfaces of shafts and stems which pass through stuffing boxes and contact surfaces of bearings shall be finished to not greater than 32 micro-inches.

PART 2 -- PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. **Noise Level:** When in operation, no single piece of equipment shall exceed the OSHA noise level requirements for a one hour exposure.
- B. For service factors of electric motors, see Division 16. Where load classifications are not specified, best modern practice shall be used.
- C. **Welding:** Unless otherwise specified or shown, all welding shall conform to the following:
 1. Latest revision of ANSI/AWWA D100.
 2. Latest revision of AWWA C206.
 3. All composite fabricated steel assemblies which are to be erected or installed inside a hydraulic structure, including any fixed or movable structural components of mechanical equipment, shall have continuous seal welds to prevent entrance of air or moisture.
 4. All welding shall be by the metal-arc method or gas-shielded arc method as described in the American Welding Society's "Welding Handbook" as supplemented by other pertinent standards of the AWS. Qualification of welders shall be in accordance with the AWS Standards governing same.
 5. In assembly and during welding, the component parts shall be adequately clamped, supported, and restrained to minimize distortion and for control of dimensions. Weld reinforcement shall be as specified by the AWS code. Upon completion of welding, all weld splatter, flux, slag, and burrs left by attachments shall be removed. Welds shall be repaired to produce a workmanlike appearance, with uniform weld contours and dimensions. All sharp corners of material which is to be painted or coated shall be ground to a minimum of 1/32-inch on the flat.
- D. **Protective Coating:** All equipment shall be painted or coated in accordance with Section 09800 "Protective Coating," unless otherwise approved by the ENGINEER. Non-ferrous metal and corrosion-resisting steel surfaces shall be coated with grease or lubricating oil. Coated surfaces shall be protected from abrasion or other damage during handling, testing, storing, assembly, and shipping.
- E. **Protection of Equipment:** All equipment shall be boxed, crated, or otherwise protected from damage and moisture during shipment, handling, and storage. All equipment shall be protected from exposure to corrosive fumes and shall be kept thoroughly dry at all times. Pumps, motors, drives, electrical equipment, and other equipment having anti-

SECTION 11000 - EQUIPMENT GENERAL PROVISIONS

friction or sleeve bearings shall be stored in weathertight storage facilities prior to installation. For extended storage periods, plastic equipment wrappers should be avoided, to prevent accumulation of condensate in gears and bearings.

- F. **Identification of Equipment Items:** Each item of equipment shipped shall have a legible identifying mark corresponding to the equipment number shown or specified for the particular item.
- G. **Vibration Level:** All equipment subject to vibration shall be provided with restrained spring-type vibration isolators or pads per manufacturer's written recommendations.
- H. **Shop Fabrication:** Shop fabrication shall be performed in accordance with the Contract Documents and the CONTRACTOR-approved Shop Drawings.

2.2 EQUIPMENT SUPPORTS AND FOUNDATIONS

- A. **Equipment Supports:** All equipment supports, anchors, and restrainers shall be adequately designed for static, dynamic, wind, and seismic loads. The design horizontal seismic force shall be the greater of 1) that noted in the general structural notes, 2) as required by the governing building code, or 3) 10 percent of gravity.
- B. **Equipment Foundations:** Equipment foundations shall be per manufacturer's written recommendations. All mechanical equipment, tanks, control cabinets, etc., shall be mounted on minimum 4-inch high concrete bases, as shown on standard structural details, unless otherwise shown or specified.
- C. **Shop Drawings:** Shop Drawings shall be submitted to the ENGINEER for review in accordance with the requirements of Section 01300 "Contractor Submittals." Shop Drawings shall be considered incomplete unless clear, concise calculations are presented showing equipment anchorage forces and the capacities of the anchorage elements provided by the CONTRACTOR.

2.3 PIPE HANGERS, SUPPORTS, AND GUIDES

- A. All pipe connections to equipment shall be supported, anchored, and guided to avoid stresses and loads on equipment flanges and equipment. Supports and hangers shall be in accordance with the requirements of Section 15020 "Pipe Supports."

2.4 FLANGES AND PIPE THREADS

- A. All flanges on equipment and appurtenances provided under this Section shall conform to ANSI B16.1, Class 125; or B16.5, Class 150, unless otherwise shown. All pipe threads shall be in accordance with ANSI/ASME B1.20.1, and with requirements of Section 15000 "Piping, General."

2.5 COUPLINGS

- A. Flexible couplings shall be provided between the driver and the driven equipment to accommodate slight angular misalignment, parallel misalignment, end float, and to

SECTION 11000 - EQUIPMENT GENERAL PROVISIONS

cushion shock loads. Where required for vertical shafts, 3-piece spacer couplings or universal type couplings for extended shafts shall be installed.

- B. The CONTRACTOR shall have the equipment manufacturer select or recommend the size and type of coupling required to suit each specific application.
- C. Taper-lock bushings may be used to provide for easy installation and removal on shafts of various diameters.
- D. Where universal type couplings are shown, they shall be of the needle bearing type construction, equipped with commercial type grease fittings.

2.6 SHAFTING

- A. **General:** All shafting shall be continuous between bearings and shall be sized to transmit the power required. Keyways shall be accurately cut in line. Shafting shall not be turned down at the ends to accommodate bearings or sprockets whose bore is less than the diameter of the shaft. All shafts shall rotate in the end bearings and shall be turned and polished, straight, and true.
- B. **Materials:** Shafting materials shall be appropriate for the type of service and torque transmitted. Environmental elements such as corrosive gases, moisture, and fluids shall be taken into consideration. Materials shall be as shown or specified unless furnished as part of an equipment assembly.
 - 1. Low carbon cold-rolled steel shafting shall conform to ASTM A 108, Grade 1018.
 - 2. Medium carbon cold-rolled shafting shall conform to ASTM A 108, Grade 1045.
 - 3. Corrosion-resistant shafting shall be stainless steel or Monel, whichever is most suitable for the intended service.
- C. **Differential Settlement:** Where differential settlement between the driver and the driven equipment may be expected, a shaft of sufficient length with 2 sets of universal type couplings shall be provided.

2.7 BEARINGS

- A. **General:** Bearings shall conform to the standards of the Anti-Friction Bearing Manufacturers Association, Inc. (AFBMA).
- B. To assure satisfactory bearing application, fitting practice, mounting, lubrication, sealing, static rating, housing strength, and other important factors shall be considered in bearing selection.
- C. All re-lubricatable type bearings shall be equipped with a hydraulic grease fitting in an accessible location and shall have sufficient grease capacity in the bearing chamber.
- D. All lubricated-for-life bearings shall be factory-lubricated with the manufacturer's recommended grease to insure maximum bearing life and best performance.

SECTION 11000 - EQUIPMENT GENERAL PROVISIONS

- E. **Bearing Life:** Except where otherwise specified or shown, all bearings shall have a minimum B-10 life expectancy of 10 years or 40,000 hours, whichever occurs first.
- F. Bearing housings shall be cast iron or steel and bearing mounting arrangement shall be as specified or shown, or as recommended in the published standards of the manufacturer. Split-type housings may be used to facilitate installation, inspection, and disassembly.
- G. Sleeve-type bearings shall have a Babbitt or bronze liner.

2.8 GEARS AND GEAR DRIVES

- A. Unless otherwise specified, gears shall be of the helical or spiral-bevel type, designed and manufactured in accordance with AGMA Standards, with a minimum service factor of 1.7, a minimum B-10 bearing life of 60,000 hours and a minimum efficiency of 94 percent. Worm gears shall not be used, unless otherwise specified.
- B. All gear speed reducers or increasers shall be of the enclosed type, oil- or grease-lubricated and fully sealed, with a breather to allow air to escape but keep dust and dirt out. The casing shall be of cast iron or heavy duty steel construction with lifting lugs and an inspection cover for each gear train. An oil level sight glass and an oil flow indicator shall be provided, arranged for easy reading.
- C. Gears and gear drives as part of an equipment assembly shall be shipped fully assembled for field installation.
- D. Material selections shall be left to the discretion of the manufacturer, provided the above AGMA values are met. Input and output shafts shall be adequately designed for the service and load requirements. Gears shall be computer-matched for minimum tolerance variation. The output shaft shall have 2 positive seals to prevent oil leakage.
- E. Oil level and drain location relative to the mounting arrangement shall be easily accessible. Oil coolers or heat exchangers with all required appurtenances shall be furnished when necessary.
- F. Where gear drive input or output shafts have to connect to couplings or sprockets supplied by others, the CONTRACTOR shall have the gear drive manufacturer supply matching key taped to the shaft for shipment.

2.9 DRIVE CHAINS

- A. Power drive chains shall be commercial type roller chains and meet ANSI Standards.
- B. A chain take-up or tightener shall be provided in every chain drive arrangement to provide easy adjustment.
- C. A minimum of one connecting or coupler link shall be provided with each length of roller chain.
- D. Chain and attachments shall be of the manufacturer's best standard material and suitable for the process fluid.

SECTION 11000 - EQUIPMENT GENERAL PROVISIONS

2.10 SPROCKETS

- A. **General:** Sprockets shall be used in conjunction with all chain drives and chain-type material handling equipment.
- B. **Materials:** Unless otherwise specified, materials shall be as follows:
 - 1. Sprockets with 25 teeth or less, normally used as a driver, shall be made of medium carbon steel in the 0.40 to 0.45 percent carbon range.
 - 2. Type A and B sprockets with 26 teeth or more, normally used as driven sprockets, shall be made of minimum 0.20 percent carbon steel.
 - 3. Large diameter sprockets with Type C hub shall be made of cast iron conforming to ASTM A 48, Class 30.
- C. All sprockets shall be accurately machined to ANSI Standards. Sprockets shall have deep hardness penetration in tooth sections.
- D. Finish bored sprockets shall be furnished complete with keyseat and set screws.
- E. To facilitate installation and disassembly, sprockets shall be of the split type or shall be furnished with taper-lock bushings as required.
- F. Idler sprockets shall be furnished with brass or Babbitt bushings, complete with oil hole and axial or circumferential grooving. Steel collars with set screws may be provided in both sides of the hub.

2.11 V-BELT DRIVES

- A. V-belts and sheaves shall be of the best commercial grade and shall conform to ANSI, MPTA, and RMA Standards.
- B. Unless otherwise specified, sheaves shall be machined from the finest quality gray cast iron.
- C. All sheaves shall be statically balanced.
- D. To facilitate installation and disassembly, sheaves shall be furnished complete with taper-lock or QD bushings as required.
- E. Finish bored sheaves shall be furnished complete with keyseat and set screws.
- F. Sliding motor bases shall be provided to adjust the tension of V-belts.

2.12 DRIVE GUARDS

- A. All power transmission, prime movers, machines, shaft extensions, and moving machine parts shall be guarded to conform with the OSHA Safety and Health Standards (29CFR1910). The CONTRACTOR shall confirm that guards comply with the requirements of OSHA. The guards shall be constructed of minimum 10 gage expanded,

SECTION 11000 - EQUIPMENT GENERAL PROVISIONS

flattened steel with smooth edges and corners, galvanized after fabrication and securely fastened. Where required for lubrication or maintenance, guards shall have hinged and latched access doors.

2.13 FLEXIBLE CONNECTORS

- A. **General:** Flexible connectors shall be installed in all piping connections to engines, blowers, compressors, and other vibrating equipment and in piping systems in accordance with the requirements of the Section 15000 "Piping, General."

2.14 INSULATING CONNECTIONS

- A. **General:** Insulating bushings, unions, couplings, or flanges, as appropriate, shall be used in accordance with the requirements of the Section 15000 "Piping, General."

2.15 GASKETS AND PACKINGS

- A. Gaskets shall be in accordance with the requirements of Section 15000 "Piping, General."
- B. Packing around valve stems and reciprocating shafts shall be of compressible material, compatible with the fluid being used. Chevron-type "V" packing shall be **Garlock No. 432, John Crane "Everseal," or equal.**
- C. Packing around rotating shafts (other than valve stems) shall be "O"-rings, stuffing boxes, or mechanical seals, as recommended by the manufacturer and approved by the ENGINEER.

2.16 NAMEPLATES

- A. Equipment nameplates of stainless steel shall be engraved or stamped and fastened to the equipment in an accessible location with No. 4 or larger oval head stainless steel screws or drive pins. Nameplates shall contain the manufacturer's name, model, serial number, size, characteristics, and appropriate data describing the machine performance ratings.

2.17 SAFETY REQUIREMENTS

- A. Where work areas are located within a flammable or toxic gas environment, suitable gas detection, ventilating, and oxygen deficiency equipment shall be provided. Workers shall be equipped with approved breathing apparatus.

2.18 OVERLOAD PROTECTION

- A. **General:** Unless otherwise specified in individual equipment Sections, all major equipment drives shall be provided with an overload protection device as follows:
- B. **Mechanical System:** The overload protection shall be a mechanical device to provide for reliable protection in the event of excessive overload. It shall be a ball detent type designed for long term repeatability and life. It shall be infinitely adjustable by a single adjusting nut. Once set it shall be tamperproof, and incorporate a torque monitoring and control system. It shall activate an alarm set for 85 percent, and a motor cutout switch set

SECTION 11000 - EQUIPMENT GENERAL PROVISIONS

for 100 percent of maximum continuous running torque. A visual torque indication shall be provided and oriented so that it may be read from the walkway. The dial shall be calibrated from 0 to 100 percent of maximum continuous running torque. The design of the torque limiter should initiate the mechanical disengagement of the drive upon overload. Each unit shall be suitable for outdoor/corrosive environments with a protective finish, corrosion inhibiting lubricants and a stainless steel cover.

- C. **Electronic System:** As an alternative to the mechanical system, the overload protection may be an Electronic Torque Monitoring Control System capable of displaying torque, rpm's, one level of overload, and two levels of overload of the drive system. It shall incorporate a time-delay for start-up and a voltage monitoring and compensation circuit for up to +/- 15 percent variation.

The overload device shall have an enclosure suitable for outdoor installation at temperatures of 0-70 degrees C, and relative humidity up to 95 percent. A visual torque dial shall be provided and oriented so that it can be easily read from the walkway.

The torque monitoring system shall be calibrated to: alarm and shut down the system in the event the torque drops to 50 percent of normal running; alarm at 85 percent of maximum continuous running torque and shut down the motor at maximum continuous running torque of the equipment. The system shall be calibrated at the factory of the equipment manufacturer and it shall be capable of monitoring twice the maximum continuous running torque of the equipment.

- D. **Manufacturers:** Overload protection systems shall be as manufactured by **American Autogard Corporation, Ferguson Machine Company, or equal.**

PART 3 -- EXECUTION

3.1 COUPLINGS

- A. The CONTRACTOR shall have the equipment manufacturer select or recommend the size and type of coupling required to suit each specific application. Installation shall be per equipment manufacturer's printed recommendations.

3.2 INSULATING CONNECTIONS

- A. All insulating connections shall be installed in accordance with the manufacturer's printed instructions.

3.3 PIPE HANGERS, SUPPORTS, AND GUIDES

- A. Hangers, supports, and guides shall be spaced in accordance with ANSI/ASME B.31.1 standard, and with tables in Section 15020 "Pipe Supports."

END OF SECTION

SECTION 11120 - PIPING, VALVES, FITTINGS AND MISCELLANEOUS EQUIPMENT

PART 1 - GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall provide all labor, equipment, tools and materials necessary to install all interior piping, fittings, valves, meters, pipe supports, gages, equipment and other miscellaneous items in accordance with the requirements of the Contract Documents and as shown on the Drawings and in accordance with the requirements of the valve, fittings and equipment manufacturers.
- B. The CONTRACTOR shall assume full responsibility for the functional operation of all items. The CONTRACTOR shall coordinate the assembly of the piping, valves and fittings and equipment to ensure the completed assemblies meet the requirements of the valve, fittings and equipment manufacturers.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Division 16 Electrical

1.3 CONTRACTOR SUBMITTALS

- A. **Shop Drawings:** Shop drawings of the following items shall be submitted to the OWNER.
 - 1. Ductile Iron Pipe
 - 2. Gate Valves
 - 3. Flange Coupling Adapters
 - 4. Fittings
 - 5. Ball Valve
 - 6. PVC Piping
 - 7. Magnetic Flow Meter
 - 8. Blower

Shop drawings shall contain the following information:

- 1. Dimension drawings.
- 2. Materials of construction.
- 3. Catalog data.
- 4. Operational instructions.
- 5. List any exceptions taken or deviations to the Contract Documents.

1.3 OPERATOR TRAINING

- A. O&M Manuals shall be provided for all items furnished under this spec section.

SECTION 11120 - PIPING, VALVES, FITTINGS AND MISCELLANEOUS EQUIPMENT

PART 2 -- PRODUCTS

2.1 DUCTILE IRON INTERIOR PIPING AND FITTINGS

- A. Piping shall be flanged ductile iron pipe and shall conform to the requirements of AWWA C-151 and be thickness class 53. Fittings shall be ductile iron and comply with the requirements of AWWA C-110/ANSI A21.10. The interior of the pipe and fittings shall have a cement mortar lining conforming to the requirements of AWWA C-104. A bituminous coating shall be provided for piping and fittings that complies with the AWWA standards.
- B. Flanges shall be ANSI B16.1 Class 125.

2.2 FLANGE COUPLING ADAPTERS

- A. Flange coupling adapters shall be restrained joint flange coupling adapters with a minimum working pressure of 200 psi (AWWA C207, Class D flanged) and shall be a Romac Industries Type RFCA or approved equal.

2.3 GATE VALVES

- A. Gate valves shall be of the iron body, non-rising bronze stem, resilient seated wedge type, equaling or exceeding the requirements of AWWA C509 and the specific requirements outlined in these specifications.
- B. Gate valves shall open counter-clockwise and be provided with a hand wheel operator for each valve.
- C. End connections shall be as indicated on the Plans. Flanges shall comply with the requirements of ANSI B16.1 Class 125.
- D. All internal ferrous metal surfaces shall be fully coated, holiday free, to a minimum thickness of 4-mils with a two part thermosetting epoxy coating. Said coating shall be non-toxic, impart no taste to water, protect all seating and adjacent surfaces from corrosion and prevent buildup of scale or tuberculation.
- E. The Contractor shall provide a letter of certification from the supplier verifying that all requirements of AWWA C509 and these specifications have been met.
- F. The valves shall have a minimum working pressure of 200 psi.

2.5 BALL VALVES

- A. Ball valves shall be Nibco PVC Schedule 80 socket true union ball valves.

2.6 MAGNETIC FLOW METER

- A. The magnetic flow meter shall be a Rosemount 8750W with wall mount transmitter. The flow meter shall have a 4-20 mA output signal indicating flow rate. The wall mount transmitter shall display rate of flow and total flow.

SECTION 11120 - PIPING, VALVES, FITTINGS AND MISCELLANEOUS EQUIPMENT

2.7 MISCELLANEOUS

- A. Bolts for all flanges shall be Type 304 stainless steel of the same size recommended for the flange bolt opening.

2.8 PVC (POLYVINYL CHLORIDE) PRESSURE PIPE, SOLVENT-WELDED

- A. PVC pipe shall be made from all new rigid unplasticized polyvinyl chloride and shall be Normal Impact Class 12454-B, Schedule 80, conforming to ASTM D 1785, unless otherwise shown. Elbows and tees shall be of the same material as the pipe. Unless otherwise shown, joint design shall be for solvent-welded construction.

2.9 BLOWER

- A. Replacement Blower for Blower No. 1 shall match existing Blower No. 3. It shall be a Kaeser Omega Blower Com-Pak-Integrated package as supplied by APSCO LLC. (425) 822-3335, Attn: Dale McBain.
- B. Blower shall be furnished with a 20 hp, 230v 3ph 60hz motor.
- C. Existing Blower No. 3 is a Kaeser Compressors Model DB 166 C, Serial No. 4929.

PART 3 -- EXECUTION

3.1 PIPING, VALVE AND FITTING INSTALLATION

- A. Installation of the valves and piping shall be in strict accordance with the requirements of the manufacturer's instructions and shop drawings; provided that nothing in the manufacturer's instructions or shop drawings shall authorize the CONTRACTOR to vary from the requirements of the Contract Documents.
- B. Tighten flange bolts so that the gasket is uniformly compressed and sealed. Bolts shall be tightened uniformly to a torque of 30 to 40 foot-pounds for 5/8 inch bolts, 50 to 65 foot-pounds for 3/4 inch bolts, 80 to 100 foot-pounds for 7/8 inch bolts and 120 to 150 foot-pounds for 1 inch bolts. Bolt threads at nut bearing surfaces shall be lubricated before tightening. Do not distort flanges.
- C. Piping, valves and fittings shall be installed as indicated on the Drawings.
- D. All pipe valves and fittings shall be pressure tested. The CONTRACTOR shall furnish all material, equipment and labor for testing and retesting the piping system. The CONTRACTOR shall take all necessary precautions to prevent any joints from separating while pipelines and their appurtenances are being tested. He shall at his own expense repair any damage to the pipes and their appurtenances or to any other structures resulting from or caused by these tests. The CONTRACTOR shall inform the OWNER of the tests at least two days in advance of the time set for testing the piping system. All new piping, valves and fittings installed under this Contract shall be tested to 300 psi. The test pressure shall be maintained a minimum of one hour or sufficiently longer to permit the OWNER to make an inspection of the system. During the test pipe, fittings, and joints shall be completely tight.

SECTION 11120 - PIPING, VALVES, FITTINGS AND MISCELLANEOUS EQUIPMENT

- E. The treatment system, piping and valves shall be disinfected in accordance with the requirements of AWWA C653. All chlorine used for disinfection shall conform to NSF 60 for use in potable water systems. The water shall be dechlorinated before discharge. Submit a written statement at the end of chlorination to certify that the above procedures have been followed; and submit the results of a bacteriological water test from an ADEC certified lab indicating water taken from the piping is free from bacteriological contamination.
- F. Install supports as shown on the Drawings to prevent strain on piping connections during and subsequent to installation.
- G. Install fittings as indicated on the Drawings to provide adequate clearance at walls and footings for flange nuts and bolts.
- H. Threaded joints shall have threads complying with ANSI B 2.1, NPT. Cut threads full and clean with sharp dies. Ram ends of pipe after threading and before assembly to remove burrs. Leave not more than three pipe threads exposed at each connection. Joint sealer shall be teflon tape.

END OF SECTION

SECTION 11336 – INFLUENT SCREEN/GRIT REMOVAL SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

- A. The CONTRACTOR shall furnish, install, and place into satisfactory operating condition the number of preliminary treatment system units as noted in paragraph 1.03.C.1. Preliminary treatment system shall be complete with semi-cylindrical screen for removing floating, particulate, or fibrous material, aerated grit removal system for removing grit from wastewater as shown on the Drawings and described in the Specifications.
- B. Influent Screen/Grit Removal System shall be a Lakeside Raptor Complete Plant Model 20CP-A as furnished and supplied Goble Sampson 22526 SE 64th Place, Suite 240, Issaquah WA 98027 (425) 392-0491 Attn: John Simon.
- C. Related Sections
 - 1. General Conditions, Supplementary Conditions, and General Requirements sections apply to work of this Section.

1.02 REFERENCES

- A. American Gear Manufacturers Association (AGMA)
- B. American Institute of Steel Construction (AISC)
- C. American Society of Testing and Materials (ASTM)
- D. American Welding Society (AWS)
- E. National Electrical Manufacturers Association (NEMA)
- F. Steel Structures Painting Council (SSPC)

1.03 SYSTEM DESCRIPTION

- A. Each preliminary treatment unit shall consist of a semi-cylindrical screen complete with screen basket, screenings wash system, screw conveyor for screenings dewatering complete with drive unit. A pre-engineered housing shall be provided complete with gasketed covers, tank vent, inlet and outlet connections, horizontal grit screw, grit dewatering screw, grit aeration system. The preliminary treatment system shall be provided complete with blower, screenings and grit baggers, liquid level sensing system, and piping appurtenances. The preliminary treatment system shall be complete with electrical controls that include a main control panel and a local control station.
- B. Systems for this project, other than a semi-cylindrical screen will not be considered for this project.
- C. Preliminary Treatment System Design Summary:

SECTION 11336 – INFLUENT SCREEN/GRIT REMOVAL SYSTEM

1.	Number of Preliminary Treatment Systems	2
2.	System Hydraulic Capacity, gal/min	450
3.	Screen Design Summary:	
a.	Screen Clean Water Hydraulic Capacity, gal/min	1,900
b.	Maximum Upstream Liquid Level, inches	29
c.	Maximum Clean Water Headloss, inches	17
d.	Nominal Screening Basket Diameter, inches	17
e.	Orifice Diameter, inches	1/4
f.	Orifice Centerline-to-Centerline Distance, inches	5/16
g.	Screen Screw Conveyor Diameter, inches	10
h.	Minimum Screen Invert to Discharge Height, inches	108
i.	Screen Speed Reducer Minimum Service Factor	1.56
j.	Screen Speed Reducer Minimum Torque Rating, in.-lb	15,700
k.	Screen Speed Reducer Minimum Thrust Rating, lb _f	5,800
l.	Screen Drive Motor Size, hp	2
m.	Maximum Spray Wash System Flow Rate, gal/min	25
n.	Minimum Spray Wash System Pressure, psig	60
o.	Screen Lower Wash System Number of Nozzles	6
4.	Blower Design Summary:	
a.	Number of Blowers	2
b.	Blower Capacity, scfm	9
c.	Blower Pressure, psig	2.5
d.	Blower Motor Size, horsepower	2
5.	Tank Design Summary:	
a.	Minimum Tank Width, feet	3.50
b.	Minimum Tank Length, feet	15.67
c.	Minimum Tank Height, feet	9.08
d.	Tank Inlet Pipe Size, inches	4
e.	Outlet Pipe Size, inches	8
6.	Electrical Power Characteristics, VAC – Hertz – Phase	460 – 60 – 3
7.	Motor and Solenoid Valve Electrical Classification	Class I – Div 1 – Group D Ex-proof
8.	Electrical Enclosure Type	NEMA 12 painted steel

1.04 PRE-QUALIFICATION

- A. All equipment manufacturers not listed in the specifications shall submit at least 15 days prior to the advertised date for receipt of bids a “Qualification Package” for the substitute or “or equal” equipment which the manufacturer proposes to furnish in lieu of products identified in the Contract Documents. The Bidder shall submit the Qualification Package under separate cover. Each Qualification Package shall be bound with protective cover, identify the specification section number and title, and the product manufacturer’s name on a cover sheet. The manufacturer shall submit the Qualification Package in a sealed sturdy box or suitable container. This section outlines the procedures for proposal of substitute or “or equal” items by “Alternate” manufacturers.

SECTION 11336 – INFLUENT SCREEN/GRIT REMOVAL SYSTEM

- B. The use of this pre-qualification requirement is intended to protect the OWNER and Bidders so that no one Bidder gains an unfair bid price advantage by quoting a lower price for a screen that does not comply with the minimum performance and salient features set for by Section 11336.
- C. The “Qualification Package” for the substitute or “or equal” equipment item of products the manufacturer proposes to furnish shall include but not be limited to, the following information as defined in 1.04.D.
- D. The Qualification Package submittal requirements for the equipment shall be as follows:
 - 1. The quality assurances set forth in Section 11336-1.10.B. for the substitute or “or equal” equipment item.
 - 2. A complete set of drawings, specifications, catalogue cut-sheets, and detailed descriptive material of proposed equipment items or products. This information shall identify all technical and performance requirements stipulated on each drawing and in each specification section.
 - 3. Detailed vendor information shall be submitted for all buy-out items such as hardware, motors, bearings, reducers, belts, sheaves, motor controllers, and instrumentation (field device, major control panel device, and anticipated control panel layout).
 - 4. List showing materials of construction of all components, including all buy-out items.
 - 5. Certification that the stainless steel passivation process outlined in paragraph 2.10.B.2. does not produce any hazardous waste by-products.
 - 6. Certification that the specified machining noted in paragraph 2.11.F. of all mating surfaces is part of the manufacturing process for the specified screen.
 - 7. Certification that the drive speed reducer manufacturer is a member of AGMA and that the torque and thrust rating are in accordance with AGMA standards.
 - 8. AWS welding inspector certifications in accordance with paragraph 2.11.G.
 - 9. Manufacturer’s recommended spare parts, including all buy-out items.
 - 10. Information on equipment field erection requirements including weight of assembled components and weight of each sub-assembly.
 - 11. A maintenance schedule showing the required maintenance, frequency of maintenance, lubricants and other items required at each regular preventative maintenance period, including all buy-out items.
 - 12. Process equipment electrical requirements and schematic diagrams.
 - 13. Provide a copy of this specification with a check next to each item to which the proposed equipment meets the specified standard. Where the proposed equipment does not strictly meet the requirements of this specification, provide information on the proposed exception to the specification that would bring the proposed, equipment into compliance with the requirements of this section.

SECTION 11336 – INFLUENT SCREEN/GRIT REMOVAL SYSTEM

14. Confirmation that the manufacturer has regularly engaged in the manufacturing and production of preliminary treatment equipment using a semi-cylindrical screen with integral grit removal in the United States for a minimum of five (5) years. No equipment will be supplied by any manufacturer with less than five years of U.S. experience.
15. The manufacturer must have installed and had in satisfactory use in this application a minimum of ten (10) installations of preliminary treatment systems using either a semi-cylindrical screen or a 3-plane cylindrical bar screen and aerated grit removal as noted in paragraph 1.03.C. Provide a list of ten (10) U.S. installations of similar type equipment comparable to the units specified.

The term “installations” shall mean individual projects/contracts. Multiple equipment units for a project will be considered as one (1) installation toward meeting the experience requirements. Installations shall be only those in the United States (fifty states). The installation shall include, but not be limited to, the following:

- a. Name and location of installation.
 - b. Name of person in direct responsible charge for the equipment.
 - c. Address and phone number of person in direct responsible charge.
 - d. Month and year the equipment was placed in operation.
 - e. Brief description of equipment
 - f. Provide the name, address, and phone number of the contact person at the company that will provide service (both warranty period and post-warranty period) for the unit to the owner.
16. Bids from manufacturers lacking the U.S. experience requirements, but meeting all technical and performance requirements of the Contract Documents, can be considered if the manufacturer provides a satisfactory two (2) year maintenance bond in lieu of evidence of experience and operation. Maintenance bond shall be for 150 percent of the replacement value of the equipment. The bonding company shall have a policy-holder rating of A+ and a financial rating of "Class XV" in the most recent edition of "Best Key Rating Guide". The bonding company shall be licensed to do business in the State of Alaska.
 17. Hydraulic performance curves showing the relationship of headloss versus the full range of downstream liquid depths for the maximum clean water hydraulic capacity noted in paragraph 1.03.C.3.a., 67% of the flow noted in paragraph 1.03.C.3.a., and 33% of the flow noted in paragraph 1.03.C.3.a. Curves based upon other manufacturer's data will not be acceptable for this project.
 18. Data from three (3) separate tests proving compliance of the screen with the "Paint Filter Test" as described in EPA Publication SW-486 Method 9095.
- E. If the Bidder fails to furnish all of the preceding information which has been deemed necessary by the Engineer to evaluate a proposed substitute or “or equal” equipment, the proposed substitute or “or equal” qualification package will be rejected by the Engineer.
 - F. The Engineer shall be the sole authority for determining conformance of a proposed substitute or “or equal” equipment item or product with the minimum requirements of the Contract Documents. Under no circumstances will the Engineer be required to prove that an “Alternate” major equipment item or product is not equal to the specified equipment item or product.

SECTION 11336 – INFLUENT SCREEN/GRIT REMOVAL SYSTEM

- G. Failure to furnish the preceding information shall be cause for rejection of a proposed substitute or “or equal” equipment item or product for use on this project.

1.05 PERFORMANCE

- A. The preliminary treatment system shall automatically screen and de-grit wastewater. Screenings shall be washed, transported, compressed, and dewatered by a single mechanism. Grit shall be washed and dewatered prior to discharge. The complete removal procedure shall be encased to reduce odors.
- B. The semi-cylindrical screen shall be designed to handle the maximum hydraulic capacity flow rate noted in paragraph 1.03.C.2. as well as the maximum clean water hydraulic capacity flow rate as noted in 1.03.C.3.a. at a maximum upstream liquid level as noted in paragraph 1.03.C.3.b. The orifice diameter noted in paragraph 1.03.C.3.e. shall be the clear opening of the perforated screenings basket. Screen designs that account for the specified spacing between a fixed bar element and adjacent reciprocating rake element (step screens), units that use wedge wire screen elements or filter-type screens cleaned by washwater only will not be acceptable for this project.
- C. The operation of the screen mechanism shall be automatically initiated at a preset high liquid level and control system. The screw conveyor shall remove solids from the stationary screenings basket. The screenings shall be transported up the screw conveyor and through a compression chamber.
- D. The screening equipment shall wash the screenings prior to compaction and shall produce dewatered screenings capable of passing the EPA Paint Filter Test as described in method 9095 of EPA Publication SW-486.
- E. The design of the screen shall be such that there are no metal-to-metal wearing surfaces in the screening, transport and compaction/dewatering sections of the screen to minimize maintenance labor and replacement parts costs.
- F. Due to the presence of rocks and large objects in raw wastewater, the screen shall be capable of picking up objects 3-inches in diameter and depositing them for washing and passage through the compaction/dewatering zone. The screen design shall prevent objects larger than 3-inches in diameter from entering into the screenings transport tube to prevent jamming.
- G. The screen screw conveyor shall be capable of transporting a minimum of 30 cubic feet per hour of wet screenings.
- H. The aerated grit chamber shall be designed to remove 90% of 50 mesh and larger grit.
- I. The horizontal grit screw and grit dewatering screw conveyors shall be capable of transporting a minimum of 20 cubic feet per hour of grit.

1.06 SCREENINGS AND GRIT WASHING

- A. The semi-cylindrical screen shall be furnished with a dual screenings spray wash system to flush organic material from the screenings prior to compaction and dewatering. The dual screenings washing systems shall be designed to minimize the amount of organic material in the screenings and to maximize solids dryness after compaction and dewatering. The dual screenings washing systems shall include:

SECTION 11336 – INFLUENT SCREEN/GRIT REMOVAL SYSTEM

1. Lower wash system shall be located immediately prior to the point where the screenings are removed from the screen and enter the screenings transport tube. This wash system shall pre-wash the screenings to remove fecal material and to prevent material from sticking to the screw conveyor flights.
 2. Screenings wash system shall be located just prior to the beginning of the compaction zone after maximum maceration of the screenings by the screenings transport screw conveyor. At the maximum wash water flow rate noted in paragraph 1.03.C.3.m., the screw conveyor shall be designed to prevent screenings from being washed down the screenings transport tube to the basket.
- B. A grit washing system shall be provided in the grit dewatering transport screw to ensure a clean grit material.

1.07 ODOR CONTROL

- A. To minimize odors and nuisance insect populations, the preliminary treatment system shall be completely containerized and enclosed from the inlet, screen basket, screenings washing system, screenings compaction/dewatering system, grit removal system and discharge. The only components open to the atmosphere shall be screenings and grit discharge chutes and the tank vent. Systems that do not provide a closed system described herein before will not be considered for this project.
- B. The design shall be such that all system components enclosed in the tank will be accessible via a stainless steel gasketed access covers.
- C. The tank enclosure shall be designed such that the 4-inch vent can be connected to a future external odor control system.

1.08 SUBMITTALS

- A. Shop drawing submittals shall be provided in accordance with Section 01300.

1.09 MATERIALS QUALITY

- A. All fabricated components of the preliminary treatment system shall be AISI Type 304 stainless steel including the screen basket, screen screw conveyor, horizontal grit screw conveyor, grit dewatering screw conveyor, tank housing, covers and support structure. Materials thicknesses identified in PART 2 - PRODUCTS are the minimum requirements for this project. Materials with increased thicknesses will be acceptable.
- B. To ensure spare parts availability, all fabricated components shall be manufactured in the United States. To ensure prompt service and to ensure spare parts availability in a timely manner and at a reasonable cost, foreign fabricated materials of construction for the components identified in paragraph 1.09.A. will not be acceptable for this project.

1.10 QUALITY ASSURANCE

- A. In order to assure uniform quality, ease of maintenance and minimal parts storage, it is the intent of these Specifications that a single manufacturer shall supply all equipment called for under this Section. The equipment manufacturer shall, in addition to the CONTRACTOR, assume responsibility for proper installation and function of the equipment.

SECTION 11336 – INFLUENT SCREEN/GRIT REMOVAL SYSTEM

- B. Naming a Manufacturer in paragraph 2.01 does not relieve them from complying with the performance requirements, salient features, and the Made in the USA requirements of the Contract Documents. The Contract Documents represent the minimum acceptable standards for the preliminary treatment system equipment for this project. All equipment shall conform fully in every respect to the requirements of the respective parts and sections of the drawings and specifications. Equipment which is a "standard product" with the manufacturer shall be modified, redesigned from the standard mode, and shall be furnished with special features, accessories, materials of construction or finishes as may be necessary to conform to the quality mandated by the technical and performance requirements of the specification.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. The preliminary treatment system shall include all necessary equipment and appurtenances as manufactured by Lakeside Equipment Corporation, of Bartlett, Illinois, or pre-approved equal.

2.02 SEMI-CYLINDRICAL SCREEN

A. Screen Basket

1. The screen shall be designed and built to withstand maximum possible static hydraulic forces exerted by the liquid to the screen. All structural and functional parts shall be sized to prevent deflections or vibrations that may impair the screening, conveying and pressing operations. All submerged components and all components of the screen in contact with the screened solids shall be of stainless steel construction.
2. The screen basket shall be of a semi-cylindrical shape and installed in the housing parallel to the direction of liquid flow. The screen shall be furnished with a 5/8-inch thick minimum upper basket support flange for mating to the screenings screw conveyor body. After welding the face of the screenings basket support flange shall be machined in accordance with paragraph 2.11.F.
3. The minimum diameter of the screening basket shall be as noted in paragraph 1.03.C.3.d.
4. The screen basket shall use perforated plate for capturing solids in the wastewater flow stream. The perforated plate screen orifice opening diameter shall be as noted in paragraph 1.03.C.3.e. with an orifice centerline spacing as noted in paragraph 1.03.C.3.f. The perforated plate screen shall have a minimum thickness of 0.12 inches for heavy-duty applications to minimize tearing.
5. Stainless steel seal plates or rubber flaps shall be provided with a profile conforming to the tank to prevent flow from by-passing the screen.

B. Screenings Conveyor and Screenings Dewatering Press

1. The semi-cylindrical screen shall be cleaned by a shaftless screw conveyor with helical flights designed to operate and to convey screened material. The shaftless screw conveyor flights for cleaning the screen shall be fabricated with 3/8-inch minimum stainless steel plate and machined in accordance with paragraph 2.11.F. Screw conveyor designs fabricated of material that is not AISI designated stainless

SECTION 11336 – INFLUENT SCREEN/GRIT REMOVAL SYSTEM

steel will not be acceptable for this project. Designs that form the shaftless portion of the screw out of bar stock shall be fabricated from AISI Type 316Ti stainless steel to prevent stress relieving after fabrication and shipment.

2. The screw conveyor flight edges shall be parallel to the face of the perforated screen with a gap not to exceed 0.040-inches.
3. Attached to the shaftless screw conveyor flights the full length of the perforated screen shall be a stainless steel backed brush composed of plastic bristles. Brush shall be attached to the shaftless screw conveyor with stainless steel holder clips and stainless steel fasteners.
4. As material is conveyed into the enclosed transport tube there shall be a transition section from the nominal screen diameter noted in paragraph 1.03.C.3.d to a nominal screenings transport tube diameter as noted in paragraph 1.03.C.3.g. The transport tube shall be fabricated of stainless steel with a wall thickness equal to or greater than that provided by Schedule 10S pipe to minimize deflection.
5. A 3/4-inch thick minimum basket support plate flange shall be welded to the lower end of the screenings transport tube to attach the screen basket and to provide for attachment of the screenings collection hopper. A 3/4-inch thick minimum drive support flange shall be welded to the upper end of the screenings transport tube for attachment of the drive assembly. After all welding of components to the screenings transport tube have been completed the fabrication shall be placed in a lathe to machine the face of the upper drive flange and to machine the face of the lower basket support plate flange for mating the basket in accordance with paragraph 2.11.F.
6. To prevent rotation of the material in the transport tube and to provide maceration of screenings during transport, there shall be a minimum of three (3) 1/4-inch minimum thick stainless steel anti-rotation bars equally spaced along the inside axis of the transport tube. Anti-rotation bars shall be welded to the inside of the transport tube.
7. In the transition section from the screen to the transport tube there shall be two (2) replaceable bearing strips to support the screw conveyor when the unit operates without screenings. These replaceable wear strips shall prevent the transport screw flights from wearing on the anti-rotation bars or on the cleaning brush. The wear strips shall be replaceable without having to remove the screw conveyor from the screenings transport tube for ease of maintenance. Wear strips shall be a special ultra high molecular weight polyethylene material filled with molybdenum disulfide and oil for superior life. The wear strips shall be held in place via a stainless steel backing housing with a bolted connection for ease of field replacement.
8. The transport screw shall change from a helical-flight shaftless design to a helical-flight shafted design just prior to the screen transition section. The shafted screenings transport screw shall have 3/16-inch minimum stainless steel flights that are welded to a 3-inch minimum diameter stainless steel torque tube. Flight thickness shall be increased on the last flights to 3/8-inch in the compaction zone. Where the transport screw passes through the discharge section a reverse stainless steel flight spiral shall be provided to cut off the compacted material plug to drop into the receiving receptacle.
9. The upper screenings conveyor torque tube shall be fitted with a removable stainless steel stub shaft that may be changed for adapting to speed reducers that are produced by various manufacturers. The shaft and screenings screw conveyor torque tube shall be accurately machined in accordance with paragraph 2.11.F. to allow a bolted close running fit design for the upper drive end stub shaft. Two (2) A325 high-

SECTION 11336 – INFLUENT SCREEN/GRIT REMOVAL SYSTEM

strength steel bolts shall be provided for the upper bolted stub shaft connection. The upper screenings conveyor torque tube shall be fitted with a removable stainless steel stub shaft that may be changed for adapting to speed reducers that are produced by various manufacturers. Welding the upper stub shaft to the screening transport screw conveyor torque tube will not be acceptable for this project.

10. The screen shall be provided with a pivoting support stand allowing for easy removal of the screen basket from the tank for maintenance purposes. To ensure operator safety during servicing of the screen, supports and support stand shall be fabricated from 1/4-inch minimum stainless steel shapes and plates.
11. A compaction zone shall be an integral part of the screenings screw conveyor and transport tube design. The compaction zone shall be designed to form a screenings plug of material and to return water released from the screened material back to the wastewater channel through circular holes that are machined into the screenings transport tube. Compaction zone shall be fabricated from 12 gauge minimum thick stainless steel welded to the screenings transport tube to provide a watertight screenings pressate collection chamber. Compaction zone housings that are non-metallic and which require seals to prevent leakage around the screenings transport tube will not be acceptable for this project. Compaction zone housing shall be furnished with a hinged and sealed access cover held in place with stainless steel latches as well as a removable dewatering section panel inside the dewatering chamber to allow direct access to the screw conveyor should the compaction zone ever become plugged. Designs that require removal of the drive assembly, discharge head or screw conveyor to gain access to the compaction zone will not be acceptable for this project.

C. Screen Drive Assembly

1. The screw conveyor shall be driven by a direct-connected, cycloidal-helical, hollow-shaft, high-thrust, in-line, AGMA rated speed reducer. The cyclo element of the speed reducer shall be designed to take a 500 percent shock load without damage. Combination gear motor designs will not be acceptable for this project. The speed reducer manufacturer shall be a member of AGMA. The speed reducer shall have a minimum service factor of as noted in paragraph 1.03.C.3.i. with a minimum torque rating as noted in paragraph 1.03.C.3.j. and a minimum thrust rating as noted in paragraph 1.03.C.3.k. at the design operating output speed of the reducer.
2. The speed reducer shall be bolted to the drive adaptor flange at upper end of the screenings transport tube.
3. The speed reducer shall be driven by a field-replaceable, NEMA C-flanged, 1,800 rev/min, ball bearing, continuous-duty, premium-efficiency, explosion-proof motor with leads to a large conduit box. Motor size shall be as noted in paragraph 1.03.C.3.l., shall be rated for electrical power characteristics as noted in paragraph 1.03.C.6. and shall be rated for an electrical environment as noted in paragraph 1.03.C.7. Explosion-proof motors shall be furnished with over-temperature thermostats in the windings designed for cutout at approximately 160°C.
4. Chain-drives, belt drives, hydraulic drives, or a separate upper bearing for the transport screw will not be acceptable for this project.

D. Screen Wash Systems

SECTION 11336 – INFLUENT SCREEN/GRIT REMOVAL SYSTEM

1. Three (3) wash systems shall be provided. Each wash system shall be furnished with a control solenoid valve, flow adjustment ball valve, stainless steel piping and fittings, flexible reinforced PVC hose and nozzles. Piping, fittings, and valves shall be 3/4-inch diameter minimum. A plant water strainer shall be provided for the incoming plant water supply. The wash water flow requirements shall be as noted in paragraph 1.03.C.3.m. with a minimum pressure as noted in paragraph 1.03.C.3.n. The three (3) wash systems shall include:
 - a. Lower spray wash system shall be located near the upper end of the screenings basket just prior to where screenings enter the screw conveyor transport tube. The lower wash system shall have the minimum of spray nozzles as noted in paragraph 1.03.C.3.o.
 - b. Screenings wash system shall be located in the upper section of the transport tube no more than 17 inches from the beginning of the compaction zone to break up and return organic materials to the flow stream and to ensure maximum screenings washing. The screenings wash system and screenings screw conveyor shall be designed to prevent washing screenings down the center of the screw conveyor.
 - c. Dewatering chamber flush water system shall periodically clean the compaction and dewatering zone via a stainless steel wash nozzle located in the compaction/dewatering chamber. The dewatering chamber flush water system shall not be a substitute for the screenings washing systems described in paragraphs 2.02.E.1.a. and 2.02.E.1.b.
2. The three (3) solenoid valves shall be 3/4-inch minimum, brass body suitable for 120 VAC operation with a rating as noted in paragraph 1.03.C.7. Solenoid valves shall be normally closed and rated for up to 100 psig. Solenoid valves shall be slow close type to minimize water hammer.
3. The three (3) ball valves shall be 3/4-inch diameter, 1/4-turn, stainless steel body with stainless steel ball and Teflon seats, and shall have an adjustable stop handle for volume control of the spray wash system.
4. Solenoid valves shall be factory installed to a piping manifold to ensure even pressure distribution to each spray wash system. The solenoid valve wiring shall be factory installed to a common junction box on the spray wash manifold for wire nut connection to external power. Conduit and fittings shall be factory installed between the solenoid valves and junction boxes. Junction box, conduit and fittings shall be rated NEMA 4/7/9 for an explosion-proof electrical environment as noted in paragraph 1.03.C.7.
5. A water strainer shall be provided that is suitable for a 3/4-inch NPT connection and a maximum flow rate as noted in paragraph 1.03.C.3.m. and suitable for a maximum pressure of 125 psig. Water filter shall be a stacked filter element design with washable 80-mesh (200 micron) polyethylene or polypropylene disc elements, polypropylene head and bowl and Buna N gaskets. Y-type strainers will not be acceptable for this project.

2.03 GRIT REMOVAL SYSTEM

A. Horizontal Grit Screw Conveyor

1. The horizontal grit screw conveyor shall have a nominal diameter of 8-inches with a 1/4-inch minimum flight thickness.

SECTION 11336 – INFLUENT SCREEN/GRIT REMOVAL SYSTEM

2. The horizontal grit screw conveyor shall be supported by the drive at one end and shall be supported by a sealed, self-lubricated polymeric composite sleeve bearing with stainless steel wear sleeve at the tail shaft end. Metallic-based lower bearings will not be acceptable for this project. The tail shaft bearing shall not take any thrust load from the horizontal grit screw conveyor. Designs that utilize a plastic liner that is in contact with the screw flights or a metallic based sleeve bearing to support the tail end of the horizontal grit screw conveyor will not be acceptable for this project.
3. The screw flight leading face shall be furnished with a continuous field-renewable Lincore 60-G, or equal, hardened stainless steel weld a minimum of 1/2-inch wide to minimize abrasion.
4. The horizontal grit screw conveyor torque tube shall be fitted with a solid stainless steel stub shaft. The stub shafts and horizontal grit screw conveyor torque tube shall be accurately machined in accordance with paragraph 2.11.F. to allow a bolted close running fit design for the drive end stub shaft and a bolted index-fit for the tail bearing stub shaft. The drive end of the horizontal grit screw conveyor torque tube shall be fitted with a removable stainless steel stub shaft that may be changed for adapting to speed reducers that are produced by various manufacturers. Welding the drive end stub shaft to the horizontal grit screw conveyor torque tube will not be acceptable for this project.
5. The horizontal grit screw conveyor shall be driven by a direct-connected, cycloidal-helical, hollow-shaft, high-thrust, in-line, AGMA rated speed reducer. The cyclo element of the speed reducer shall be designed to take a 500 percent shock load without damage. The speed reducer manufacturer shall be a member of AGMA. Combination gear motor designs will not be acceptable for this project. The speed reducer shall have a minimum service factor of 1.51, shall have with a minimum torque rating of 15,300 in-lb, and shall have a minimum thrust rating of 5,800 lb_f at the design operating output speed of the reducer.
6. The speed reducer shall be driven by a field-replaceable, NEMA C-flanged, 1,800 rev/min, ball bearing, continuous-duty, premium-efficiency, explosion-proof motor with leads to a large conduit box. Motor size shall be 1 horsepower, shall be rated for electrical power characteristics as noted in paragraph 1.03.C.6. and shall be rated for an electrical environment as noted in paragraph 1.03.C.7. Explosion-proof motors shall be furnished with over-temperature thermostats in the windings designed for cutout at approximately 160°C.
7. Chain-drives, belt drives, hydraulic drives, or a separate bearing for the horizontal grit screw will not be acceptable for this project.
8. Drive shall be furnished complete with stainless steel stuffing box, seal packing gland, and gland follower. The stuffing box discharge shall have a drip lip with 1-inch NPT connection so that any leakage can be drained away from the tank.

B. Grit Dewatering Screw Conveyor

1. The grit dewatering screw conveyor shall have a nominal diameter of 8-inches with a 1/4-inch minimum flight thickness.
2. The grit dewatering screw conveyor shall be supported by the drive at one end and shall be supported by a sealed, self-lubricated polymeric composite sleeve bearing with stainless steel wear sleeve at the tail shaft end. Metallic-based lower bearings will not be acceptable for this project. The tail shaft bearing

SECTION 11336 – INFLUENT SCREEN/GRIT REMOVAL SYSTEM

shall not take any thrust load from the grit dewatering screw conveyor. Designs that utilize a plastic liner that is in contact with the screw flights or a metallic based sleeve bearing to support the tail end of the grit dewatering screw conveyor will not be acceptable for this project.

3. The screw flight leading face shall be furnished with a continuous field-renewable Lincore 60-G, or equal, hardened stainless steel weld a minimum of 1/2-inch wide to minimize abrasion.
4. The grit dewatering screw conveyor torque tube shall be fitted with a solid stainless steel stub shaft. The stub shafts and grit dewatering screw conveyor torque tube shall be accurately machined in accordance with paragraph 2.11.F. to allow a bolted close running fit design for the drive end stub shaft and a bolted index-fit for the lower tail bearing stub shaft. The drive end of the grit dewatering screw conveyor torque tube shall be fitted with a removable stainless steel stub shaft that may be changed for adapting to speed reducers that are produced by various manufacturers. Welding the drive end stub shaft to the grit dewatering screw conveyor torque tube will not be acceptable for this project.
5. The grit dewatering screw conveyor shall be driven by a direct-connected, cycloidal-helical, hollow-shaft, high-thrust, in-line, AGMA rated speed reducer. The cyclo element of the speed reducer shall be designed to take a 500 percent shock load without damage. The speed reducer manufacturer shall be a member of AGMA. Combination gear motor designs will not be acceptable for this project. The speed reducer shall have a minimum service factor as noted in paragraph 1.03.C.3.i. with a minimum torque rating as noted in paragraph 1.03.C.3.j. and a minimum thrust rating as noted in paragraph 1.03.C.3.k. at the design operating output speed of the reducer.
6. The speed reducer shall be driven by a field-replaceable, NEMA C-flanged, 1,800 rev/min, ball bearing, continuous-duty, premium-efficiency, explosion-proof motor with leads to a large conduit box. Motor size shall be 2 horsepower, shall be rated for electrical power characteristics as noted in paragraph 1.03.C.6. and shall be rated for an electrical environment as noted in paragraph 1.03.C.7. Explosion-proof motors shall be furnished with over-temperature thermostats in the windings designed for cutout at approximately 160°C.
7. Chain-drives, belt drives, hydraulic drives, or a separate bearing for the horizontal grit screw will not be acceptable for this project.
8. The grit dewatering screw conveyor shall be housed in a transport tube fabricated of Schedule 10S minimum stainless steel pipe. The upper half of the grit dewatering screw conveyor shall be designed to be shipped separately from the tank. The grit dewatering screw conveyor torque tube shall be a bolted splined for field connection. The upper half of the grit dewatering screw conveyor torque tube shall be provided with 5/8-inch thick minimum stainless steel mating flanges machined in accordance with paragraph 2.11.F.
9. The grit dewatering screw conveyor shall be furnished with a grit washing water line located near the tank liquid level. Grit washing system shall be designed to deliver approximately 0.25 gal/min of wash water on a continuous basis.

2.04 GRIT AERATION SYSTEM

A. Grit Aeration Headers

SECTION 11336 – INFLUENT SCREEN/GRIT REMOVAL SYSTEM

1. The grit removal system shall be furnished with a 2-inch stainless steel aeration header system complete with two (2) 1-1/2-inch diameter down comer pipes and horizontal header pipes with stainless steel body diffusers with self-sealing rubber membranes to minimize plugging of the aeration header when the air is turned off. Designs that utilized holes drilled in the aeration header piping will not be acceptable for this project.
2. The aeration header system shall be furnished with 1-1/2-inch diameter ball valves to control the air to each header as well as a 2-inch diameter main air control valve. Ball valve construction shall be as noted in paragraph 2.02.E.3.
3. All pipe, pipe fittings, pipe supports, and hardware shall be stainless steel.
4. The aeration header shall be designed so that it can be removed from the tank without requiring entry into the tank for operator safety.

B. Grit Aeration Blower

1. The number of rotary positive displacement blowers to be furnished shall be as noted in paragraph 1.03.C.4.a. A rotary positive displacement blower shall be furnished to provide the volume of air as noted in paragraph 1.03.C.4.b. at a minimum air pressure as noted in paragraph 1.03.C.4.c. Regenerative-type blowers will not be acceptable for this project.
2. The blower shall be driven by an 1,800 rev/min, ball bearing, continuous-duty, premium-efficiency, totally-enclosed, fan-cooled motor with leads to a large conduit box. Motor size shall be as noted in paragraph 1.03.C.4.d. Blower motor shall be rated for electrical power characteristics as noted in paragraph 1.03.C.6., shall be rated for an electrical environment as noted in paragraph 1.03.C.7., and shall be suitable for a variable frequency drive (VFD). Explosion-proof motors shall be furnished with over-temperature thermostats in the windings for cutout at approximately 160°C.
3. Blower assembly shall be furnished complete with fabricated steel base, combination inlet air filter-silencer, pressure relief valve, flexible connectors, check valve, and fiberglass enclosure with louvered air vents.

2.05 HOUSING

- A. The preliminary treatment system housing shall be constructed of stainless steel with 10 gauge minimum sides and bottom and 3/16 inch minimum end plates. Housing shall be adequately stiffened to prevent distortion due to the liquid. Tank shall be furnished with adjustable support legs (\pm 3/4 inches) for ensuring field leveling of the tank. Tank shall have a nominal width as noted in paragraph 1.03.C.5.a., a nominal length as noted in paragraph 1.03.C.5.b. and a nominal height as noted in paragraph 1.03.C.5.c.
- B. A 12-inch long plain end Schedule 40S stainless steel pipe stub inlet shall be provided with a diameter as noted in paragraph 1.03.C.5.d.
- C. A 12-inch long plain end Schedule 40S stainless steel pipe stub outlet shall be provided with a diameter as noted in paragraph 1.03.C.5.e.

SECTION 11336 – INFLUENT SCREEN/GRIT REMOVAL SYSTEM

- D. Housing shall be provided with a 10 gauge minimum stainless steel access cover for the screen complete with gaskets. Cover shall be an inset design into self-rimming upper tank housing with a seal that shall prevent leakage in the event of a seal failure.
- E. Cover shall be provided with a proximity sensor that when the cover is opened shall shut down operation of the screen for safety purposes. The cover sensor wiring shall be factory installed to junction box on the fixed portion of the tank cover for wire nut connection to external power. Conduit and fittings shall be factory installed between the sensor and junction boxes along with flexible conduit to allow the cover to open. Junction box, conduit and fittings shall be rated NEMA 4/7/9 for explosion-proof for an electrical environment as noted in paragraph 1.03.C.7.
- F. Grit system portion of the tank shall be furnished with lift-off cover sections. Each cover section shall be an inset design into self-rimming upper tank housing with a seal that shall prevent leakage in the event of a seal failure.
- G. Tank shall be furnished with a 4-inch minimum diameter Schedule 10S stainless steel pipe vent.

2.06 CONTROL SYSTEM

- A. All controls necessary for the fully automatic operation of the screen, grit removal system, and supporting equipment shall be provided in accordance with NEMA standards.
- B. The electrical control system shall provide for automatic control of the screen via a high liquid level using a liquid level control system in connection with an adjustable time clock. The screen shall operate at a high liquid level or a pre-determined time sequence to provide a variable time between cleaning operations.
- C. The ultrasonic level sensing system shall be a Siemens/Milltronics MultiRanger 100 with programmer and an ST-H level transducer that is suitable for a Class I – Division 1 – Group D explosion-proof electrical environment. The ultrasonic level sensor shall be mounted to the top cover of the tank. The cover sensor wiring shall be factory installed to a junction box on the fixed portion of the tank cover for wire nut connection to external power. Conduit and fittings shall be factory installed between the ultrasonic level sensor and junction box along with flexible conduit. Junction box, conduit and fittings shall be rated NEMA 4/7/9 for explosion-proof locations as noted in paragraph 1.03.C.7.
- D. The CYCLE/RE-SET pushbutton shall allow the control logic to be re-set after the E-STOP pushbutton is pulled out. The CYCLE/RE-SET pushbutton shall also allow the plant operations staff to run the preliminary treatment system through a complete cleaning cycle by holding in the pushbutton for a pre-set time.
- E. A remote-mounted main control panel (MCP), for each preliminary treatment unit, shall be suitable for wall mounting and shall contain the following items:
 - 1. Door interlocked fused disconnect
 - 2. Allen-Bradley MicroLogix 1400 programmable logic controller (PLC) with integral LCD, Ethernet, relays, and timers to monitor equipment-mounted electrical devices and to perform necessary logic functions
 - 3. Variable frequency drive (VFD) with line reactor for each of the following:
 - a. Screen

SECTION 11336 – INFLUENT SCREEN/GRIT REMOVAL SYSTEM

- b. Blower
 4. Starters for the following:
 - a. Horizontal grit screw
 - b. Grit dewatering screw
 5. Control power transformer fused primary and secondary with 120 VAC transient voltage surge suppressor (TVSS)
 6. Full-voltage LED pilot lights for each of the following:
 - a. Control power ON (White)
 - b. Screen RUN (Green)
 - c. Horizontal grit screw RUN (Green)
 - d. Grit dewatering screw RUN (Green)
 - e. Blower RUN (Green)
 - f. Multifunctional overload shutdown/screen FAULT (Red)
 - g. Screen high water level ALARM (Red)
 7. Door-mounted elapsed time meters for each of the following:
 - a. Screen
 - b. Horizontal grit screw
 - c. Grit dewatering screw
 - d. Blower
 8. Remote dry contact outputs for each of the following:
 - a. Screen RUN
 - b. Horizontal grit screw RUN
 - c. Grit dewatering screw RUN
 - d. Blower RUN
 - e. Multifunctional overload shutdown/screen FAULT
 - f. Screen high water level ALARM
 9. Combination alarm horn with silence-reset pushbutton and flashing alarm light
 10. White phenolic nameplates with black lettering
 11. 600 VAC terminal block
 12. U.L. label for the project application
 13. Electrical enclosure in accordance with paragraph 1.03.C.8.
- F. An operator local control station (LCS) shall be provided for the preliminary treatment system and shall contain the following items:
1. HAND-OFF-AUTO selector switches for the following:
 - a. Screen drive
 - b. Screen lower wash system solenoid valve
 - c. Screen screenings wash system solenoid valve
 - d. Screen dewatering wash system solenoid valve
 - e.
 - f. Horizontal grit screw
 - g. Grit dewatering screw
 2. FORWARD-OFF-REVERSE selector switch (spring return to center) for each of the following:
 - a. Screen
 3. E-STOP pushbutton (Red)
 4. CYCLE/RE-SET pushbutton (Black)

SECTION 11336 – INFLUENT SCREEN/GRIT REMOVAL SYSTEM

5. White phenolic nameplates with black lettering
6. NEMA 4/7/9 cast aluminum explosion-proof enclosure

2.07 SCREENINGS AND GRIT BAGGERS

- A. The screenings and grit discharge chutes shall be furnished with a bagging device to contain and encase the washed and dewatered screenings and grit.
- B. The bagging device mounting assembly shall be fabricated of 12 gauge minimum stainless steel.
- C. The screenings and grit bagger attachments shall be designed to be fitted with individual replaceable plastic bags held in place via a nylon strap. Two (2) cases of fifty (50) bags each shall be provided.

2.08 SPARE PARTS

- A. The following spare parts shall be provided:
 1. One (1) complete solenoid valve assembly
 2. One (1) solenoid valve re-build kit
 3. One (1) brush assembly with stainless steel mounting hardware
 4. One (1) set of lower wear strips and mounting hardware
 5. One (1) horizontal grit screw tail bearing
 6. One (1) grit dewatering screw tail bearing
 7. Three (3) spare fuse sets of each size and type
 8. Two (2) blower inlet filters
- B. Spare parts shall be individually boxed with the project name and part number clearly identified on each individual box. All spare parts shall be shipped in a separate crate and clearly labeled. Spare parts shall be stored indoors by the Contractor in a temperature-controlled environment.

2.09 ANCHOR BOLTS

- A. Equipment manufacturer shall furnish all anchor bolts of ample size and strength required to securely anchor each item of equipment. Anchor bolts, hex nuts, and washers shall be AISI Type 304 stainless steel unless noted otherwise.
- B. Anchor bolts shall be set by the CONTRACTOR. Equipment shall be placed on the foundations, leveled, shimmed, bolted down, and grouted with a non-shrinking grout.

2.10 SHOP SURFACE PREPARATION AND PAINTING

- A. Electric motors, speed reducers, and other self-contained or enclosed components shall have manufacturer's standard enamel finish.
- B. Clean all stainless steel surfaces by using the following procedure:
 1. Wire brush all weld areas to remove weld spatter. Brushes shall be of AISI Type 304 stainless steel and used only on AISI Type 304 or 304L stainless steel.

SECTION 11336 – INFLUENT SCREEN/GRIT REMOVAL SYSTEM

2. Clean all stainless steel surfaces and provide glass bead blast or chemically treat all external non-wetted stainless steel to a uniform finish with Citrisurf 77. Chemical passivated stainless steel products shall not produce any hazardous wastes during the passivation process. The preliminary treatment system manufacturer shall clearly identify the passivation procedure methodology and shall certify that no hazardous wastes were produced.

2.11 SOURCE QUALITY CONTROL

- A. All structural steel components of the preliminary treatment system shall be stainless steel and shall be fabricated in the United States conforming to the requirements of "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings" published by the American Institute of Steel Construction.
- B. Fabricate all parts and assemblies from sheets and plates of AISI Type 304 stainless steel conforming ASTM A666, unless noted otherwise. Fabricate all rolled or extruded shapes to conform to ASTM A276. Fabricate all tubular products and fittings to conform to ASTM A269, A351, and A403.
- C. All welding in the factory shall use shielded arc, inert gas, MIG, or TIG method. Add filler wire to all welds to provide for a cross section equal to or greater than the parent metal. Fully penetrate butt welds to the interior surface and provide gas shielding to interior and exterior of the joint.
- D. Field welding of stainless steel will not be permitted.
- E. Bolts, nuts, and washers shall be AISI 304 stainless steel furnished in accordance with ASTM A193.
- F. All surfaces that are specified to be machined shall be designed and fabricated to provide a runout of not more than 0.005 inches and a concentricity to within 0.005 inches.
- G. Design and fabrication of structural steel members shall be in accordance with AISC and AWS Standards. The manufacturer shall comply with the American Welding Society (AWS) and the American Institute of Steel Construction (AISC) most current listed standards and qualifications in 2004 D1.1, the criteria per the requirements of Section 6 - Inspection - Structural Welding Code. Evidence of such AWS and AISC compliance shall be submitted with shop drawing submittals as follows:
 1. AWS Certified Welding Inspectors (minimum 2 on staff) shall conform to all standards, current or previous as listed in section 6.1.4 AWS QC1, Standard and Guide for Qualification and Certification of Welding Inspectors.
 2. AWS Non Destructive Testing Inspectors (Level I, II, III) for Magnetic Particle and Ultra-Sonic testing (minimum 2 on staff) shall conform to all standards, current or previous as listed in and in conformance with The American Society for Non-Destructive Testing (ASNT-TC-1A).

PART 3 - EXECUTION

3.01 SHOP TESTING

- A. Prior to shipment of the equipment the preliminary treatment system shall be operated for a minimum of four (4) hours at the fabrication location with the specific drive motors that will be furnished for the project.

SECTION 11336 – INFLUENT SCREEN/GRIT REMOVAL SYSTEM

- B. During the shop test the following parameters shall be recorded:
 - 1. Motor serial number
 - 2. Amperage draw at start-up, after two hours and after four hours during forward operation
 - 3. Amperage draw during reverse operation
- C. A certified shop test report shall be submitted to the ENGINEER.

3.02 FIELD PREPARATION AND PAINTING

- A. The CONTRACTOR shall touch-up all shipping damage to the paint and stainless steel as soon as the equipment arrives on the job site.
- B. The CONTRACTOR shall supply paint for field touch-up and field painting.
- C. The CONTRACTOR shall finish paint electrical motors, speed reducers, and other self-contained or enclosed components with oil-resistance enamel.
- D. Prior to assembly all stainless steel bolts and nut threads shall be coated with a non-seizing compound by the CONTRACTOR.

3.03 INSTALLATION

- A. The manufacturer shall schedule two (2) trips to the project site for equipment start-up assistance as noted in paragraph 3.02.B. for the CONTRACTOR and for operating training as noted in paragraph 3.03.A. for OWNER personnel.
- B. After the CONTRACTOR has installed the screening and grit removal pre-treatment unit and the unit is capable of being operated, the equipment manufacturer shall furnish a qualified representative for a minimum of six (6) days to inspect the equipment and to supervise field testing and start-up for the CONTRACTOR.
- C. After the equipment has been placed into operation, the manufacturer's representative shall make all final adjustments for proper operation.

3.04 FIELD TESTING

- A. Prior to final acceptance of the screen, three (3) tests shall be conducted on the screenings according to the EPA Paint Filter Test as described in method 9095 of EPA Publication SW-486.
- B. Should the system fail to produce screenings capable of passing the "EPA Paint Filter Test", the manufacturer shall at its own expense make all necessary modifications to the equipment until such tests can be passed.

3.05 OPERATOR TRAINING

SECTION 11336 – INFLUENT SCREEN/GRIT REMOVAL SYSTEM

- A. Provide operator training for OWNER'S personnel after system is operational. Training will take place while manufacturer's representative is at the job site for inspection.

END SECTION 11336

SECTION 13122 - PREFABRICATED METAL BUILDINGS

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. **General:** The CONTRACTOR shall design, furnish, and install the nominal 75' by 85' pre-fabricated metal building referenced on the as the Treatment Building or the Wastewater Treatment Building, including structural framing (columns, rafters, struts, purlins, girts, and structural support for equipment and doors penetrating the building); insulated metal wall and roof panels and all required support framing; metal flashings; snow stops, trim; diagonal bracing; fasteners with rubber grommets; louvers; all other roof and perimeter wall accessories; metal wall studs and framing; and material required for a complete watertight installation of the exterior surface of the building wall and roof system.
- B. The CONTRACTOR shall design, furnish and install insulated metal wall and roof panels on the existing Solids Building.
- C. All structural steel shall be hot dip galvanized in accordance with ASTM A 123. Purlins and girts and fasteners shall be galvanized in accordance with ASTM A 653 G90.

1.2 QUALITY ASSURANCE

- A. **Erector's Qualifications:** The erector of the prefabricated metal building shall be approved by the prefabricated metal building manufacturer.
- B. **Manufacturer's Qualifications:** The manufacturer of the prefabricated metal building shall be a current member of the Metal Building Manufacturer's Association (MBMA).
- C. **Approval Submittals:** In compliance with Section 01300, "Contractor Submittals," provide approval submittals identified in the following paragraphs.
- D. **Manufacturer's Literature:** Submit complete manufacturer's literature and technical data indicating any deviation from the Drawings and Specifications required for complete installation of the proposed prefabricated metal building.
- E. **Certification:** Submit, via CONTRACTOR's transmittal, properly identified with project name, location and date, certification of manufacturer's compliance with the requirements specified herein.

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. **Codes:** All codes, as referenced herein, are specified in Section 01090, "Reference Standards."
- B. **Commercial Standards:**
 - Metal Building Mfg. Assoc. - Metal Building Systems Manual
 - American Iron and Steel Institute
 - Specification for the Design of Cold Formed Steel Structural Members
 - American Welding Society - Structural Welding Code, AWS D1.1.

SECTION 13122 - PREFABRICATED METAL BUILDINGS

Steel Door Institute

American Institute of Steel Construction

Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings
Code of Standard Practice for Steel Buildings and Bridges

American Society Testing and Materials - Designations as referenced herein.

Federal Specifications As referenced herein.

Architectural Aluminum Manufacturer's Assoc.

International Building Code IBC.

Factory Mutual (FM)

1.4 CONTRACTOR SUBMITTALS

- A. **Submittals:** Submittals shall be made in accordance with Section 01300, "Contractor Submittals."
- B. **Shop Drawings:** Submit coordinated shop drawings showing all components, including doors and other accessories, and structural calculations. Obtain the ENGINEER's review set prior to placing the final order for fabrication. The shop drawings shall show all material, components, finishes, fastenings, fasteners with rubber grommets, methods of joining and sealants. The shop drawings shall include, as a minimum, the following drawings:
1. Drawings showing footing loads.
 2. Foundation anchor bolt plan to match existing anchor bolt, shear angle, and baseplate details for this project.
 3. The building roof plans showing sizes and locations of all structural members and bracing, additions, and canopies.
 4. Detailed drawings of the rigid frames together with building elevations showing sizes and locations of all wall structural members and bracing.
 5. Calculations, signed and stamped specifically for this project, including a complete structural stress and deflection analysis of all structural components and connections for this project; should the building design proposed use bolted moment-resistant connections in the main frames, the prying action of the bolts shall be considered in the design.
 6. Details of all door and other openings along with their necessary support framing and other accessories.
 7. Specifications for gaslvanizing of all steel members of the building including main structural steel, girts and purlins.

SECTION 13122 - PREFABRICATED METAL BUILDINGS

8. Information on the insulated metal wall and roof panels as necessary to review in accordance with the Specifications herein.

C. Standard Details:

1. Manufacturer's standard details that pertain to the building may be used in addition to these Drawings provided that the portions that apply are clearly marked and those parts that do not apply are clearly marked. Blanket submittal of all standard details, regardless of application to the specific project, will be returned for compliance with this Specification. This also applies to general structural calculations that have not been specifically prepared or assembled for this project.

2. Upon approval, the CONTRACTOR shall furnish five prints of the Drawings for distribution and file. The design calculations and Drawings shall be stamped by an engineer registered in the state of Alaska.

3. Color Samples: Color samples of all prefabricated metal building components requiring color selection or approval shall be submitted to the ENGINEER for review.

1.6 GUARANTEE

A. The prefabricated metal building manufacturer shall warrant that the materials furnished will be free from defects in material and workmanship on the shipment date; furthermore, that he will correct, by repair or replacement, any such defect detected within 1 year from the date of substantial completion of the project. In addition, the prefabricated metal building manufacturer shall warrant the following:

1. The paint film on roof panels will not, under normal weather and atmospheric conditions for the design location, crack, check, blister, peel, flake, chip, or lose adhesion for a period of 20 years from the shipment date.

2. The paint film on wall panels will not, under normal weather and atmospheric conditions for the design location (1) chalk in excess of ASTM D659, No. 8 rating, within 5 years from the shipment date; (2) fade more than 5 NBS units within 10 years from the shipment date; and (3) crack, check, blister, peel, flake, chip, or lose adhesion within 20 years from the shipment date.

B. Should failure be reported within such period as enumerated in (1) and (2), the prefabricated metal building manufacturer shall repaint in accordance with original requirements any such panels at no cost to the OWNER.

PART 2 -- PRODUCTS

2.1 GENERAL

A. **Materials:** The use of a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired only. Products of other manufacturers will be considered in accordance with the General Conditions.

SECTION 13122 - PREFABRICATED METAL BUILDINGS

- B. **Design:** The design of the prefabricated metal building shall conform to the current editions of AISC "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings" and AISI "Specifications for the Design of Light-Gauge Cold-Formed Steel Structural Members." Welding shall conform to those sections of the American Welding Society's "Structural Welding Code" relating to welding procedures.

2.2 DESIGN LOADS

The steel buildings shall be designed for their own dead loads plus the following loads:

Live Load	20 psf (pounds per square foot)
Roof Snow Load	150 psf
Design Wind Load	110 mph 3 sec gust with exposure C
Earthquake Load	Seismic acceleration in accordance with the IBC for Haines Alaska (zip code 99827)

- B. The design of the buildings and roof overhangs for wind horizontal and uplift forces and for earthquake forces shall be in accordance with the building code stipulated under paragraph 1.3 of this Section.

2.3 MANUFACTURERS

- A. The building shall be as manufactured by Garco (Contact Number (509) 444-7108), Butler, Varco Pruden or approved equal.

2.4 GENERAL DESCRIPTION OF BUILDING

- A. **General.** The building is to be provided complete with galvanized structural steel framing, metal wall and roof panel systems, door frames, doors, louvers, and all necessary trim.
- B. **Dimensions.** Building dimensions shall be as shown on the Drawings.
- C. **Structural System.** The building's system for resisting lateral forces shall consist of a clear span rigid frame with variable depth column and rafter sections of shop welded steel plates, and a nominal eave height as shown on the drawings. The frames shall be designed to resist all loads listed in paragraph 2.2A of this section.
- D. **Column Spacing.** The rigid frames shall be spaced as shown on the Drawings.

2.5 FOUNDATION AND FOOTINGS

- A. The CONTRACTOR shall use the existing foundation and footings for the steel building.
- B. The CONTRACTOR shall design and coordinate the details of anchorages of steel building to the existing foundations including field confirmation of bolt patterns.

SECTION 13122 - PREFABRICATED METAL BUILDINGS

2.6 STRUCTURAL FRAMING

- A. All structural steel members shall conform to AISC "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings." Minimum steel shall be ASTM A 36. Steel used in the building shall be hot dip galvanized after fabrication. No other method of galvanizing the structural steel members will be accepted.
- B. Building columns shall be located as shown on the Drawings, and as described in this Specification. Additional framing shall be designed to avoid interference with all equipment, piping, electrical, and ventilation work.

2.7 INSULATED METAL WALL AND ROOF PANELS

- A. The complete insulated Metal Wall and Roof Panel system shall consist of steel-faced factory insulated exterior wall and roof panels, panel attachments, sealants, mastics, trim and flashings are required for a weather tight assembly.
- B. Insulated Metal Wall and Roof Panels shall be as manufactured by "All-Weather Insulated Panels" or approved equal.
- C. Color chips shall be submitted to the Engineer for selection of the color to be used. The OWNER will select from the standard colors offered by the manufacturer. Interior color shall be Imperial White.
- D. Wall panels shall be an 2" All Weather Insulated Panels Mesa (DM40) with R= 16. 26 ga minimum, galvalume per ASTM A792, PVDF exterior and vinyl plastisol polyvinylchloride interior factory applied coatings.
- E. Roof panels shall be a 3.25" All Weather Insulated Panels Standing Seam (SR2) with R=26. 26 ga minimum, galvalume per ASTM A792, PVDF exterior and vinyl plastisol polyvinylchloride interior factory applied coatings.
- F. Provide miscellaneous components as required for complete installation including but not limited to gasketed premanufactured trim accessories of prefinished corner units, ridge closures, clips, seam covers, battens, flashings, sealants, gaskets, fillers, closure strips, snow stops and similar items. Provide closures and fasteners as required to provide a weather-tight enclosure. Match materials and finishes of metal wall and roof panels.
- G. Fabricate panels, structural clips and other components of the roof and wall system for the following installed performances:

Wall Loading: Wind Load 110 mph wind speed, exposure C, and I equal to 1.15.

Roof Loading: Wind Load 110 mph wind speed, exposure C, and I equal to 1.15, including a snow load of 150 psf and a live load of 20 psf.

Water Penetration: No significant, uncontrolled leakage at 6 lbs. per sq. ft. pressure with spray test per ASTM E 331-70.

SECTION 13122 - PREFABRICATED METAL BUILDINGS

Air Infiltration: 0.02 cfm per square foot for gross roof/wall areas, with a 4 lbs. differential pressure.

- H. Snow Retention System: Shall be non-penetrating system for sloped metal roof system to prevent ice and snow from sliding off roof. Snow retention system shall consist of aluminum extrusion secured to standing seam with non-penetrating stainless steel set screws having rounded points. Snow Retention System to be ColorGard as Manufactured by Metal Roof Innovations Ltd. Provide spacing per manufacturers recommendations.

2.8 SEALANT

- A. **Standing Seam Sealant:** Approved type non-shrinking, non-drying butyl-based sealant specifically formulated for factory application in standing seams and to allow roof panel assembly at temperatures from minus 10 degrees F to 140 degrees F.
- B. **Roof Panel Sealant:** Approved type non-shrinking, non-drying butyl-based sealant, specifically formulated for roof application at temperatures from 20 degrees F to 120 degrees F.

2.9 FRAMING FOR OPENINGS

- A. Framing for openings where doors and louvers occur shall be stiffened flange channels and shall be provided by the prefabricated metal building manufacturer. Provide, in addition, all accessory clips as required for fastening frames of said items to framing.

2.10 TRIM

- A. All trim shall be factory-formed and factory-painted. Trim shall include ridge cap, rake trim, simple eave trim, panel side trim, and corner trim, door trim, trim to connect to the existing building and other trim necessary to complete the building in an acceptable manner.

2.11 MISCELLANEOUS

- A. Items such as panel fasteners, weather sealing compounds, roof jacks, roof curbs, bolts, nuts, gaskets, and other similar necessary components shall be in new and unused condition and shall be in accordance with the prefabricated metal building manufacturer's recommendations.

2.12 GALVANIZING

- A. All structural steel components such as clear span rigid frames, columns, shall be hot dip galvanized in accordance with ASTM A 123.
- B. Purlins and girts shall be galvanized in accordance with ASTM A 653 G90.

PART 3 -- EXECUTION

3.1 INSPECTION

- A. Prior to performing any work of this section, verify that all work of other trades, as applicable, is complete to the point where the installation may properly commence.

SECTION 13122 - PREFABRICATED METAL BUILDINGS

3.2 FABRICATION

- A. The building shall be factory-fabricated to the manufacturer's written standards and shall be in accordance with AISC "Specification for the Design, Fabrication, and Erection of Structural Steel Buildings."
- B. All material shall be completely fabricated and prepared for shipment knocked down including any necessary crating or bundling. All parts of building are to be accurately made and true to dimension so that during erection all parts will easily fit together.

3.3 ERECTION

- A. Erection of the building shall be in accordance with the manufacturer's standards and shall be workmanship of the highest quality. No field cutting of structural parts will be permitted. Field cutting and patching of panels or accessories will not be permitted unless required, in the sole and absolute judgment of the ENGINEER, to make installation of the panels or accessories feasible, and then only with his explicit approval. Such field modification shall be performed in a manner which will not impair the appearance, weather-tightness, or structural quality of the material. Erection shall be accomplished in sufficient time to meet the schedule specified.

3.4 HANDLING, STORAGE AND PROTECTION

- A. The CONTRACTOR shall store, handle and protect the building components, both before and during installation, so there will be no damage to any material covered in this section. Material shall be stacked on platforms and covered or stored in any other approved manner which will protect the materials from contact with the soil and exposure to the weather.
- B. Surface finishes which are damaged prior to or during erection, or where material and workmanship on any component does not conform to these Specifications, shall be replaced or restored to the original condition at no extra cost to the OWNER. Minor scratches, dents, and holes shall be repaired and painted with similar enamel of thickness and color to match original coating.
- C. **Site Cleanup:** The erector shall remove from the building and building site all erector's temporary buildings, all debris and rubbish resulting from the erection work, including all unused materials and residue from the erection process.

END OF SECTION

SECTION 13300 - BUILDING GENERAL PROVISIONS

PART 1 - GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall provide all labor, equipment, tools and materials necessary for the construction of a complete and operable replacement building for the Barnett Pump Station. The work generally includes the following:

- Reinforced Concrete
- Rough Carpentry
- Doors and Hardware
- Miscellaneous Metal Construction
- Insulation
- Painting
- Roofing

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Division 16 Electrical

1.3 CODES AND STANDARDS

- A. Codes: All construction shall be performed in strict conformance with applicable codes and regulations. Work shall be in accordance with Uniform Building Code and the applicable codes of the State of Alaska. Plans and specifications shall govern in case the minimum code requirements are exceeded.

- B. Standards

- | | |
|------------|---|
| AITC 104 | Timber Construction Manual, Timber Construction Details |
| AITC 105 | Timber Construction Manual, Recommended Practice for the Erection of Structural Timber Framing |
| ASTM D 226 | Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing |
| AWPA C1 | AWPA Manual of Recommended Practice, Standard for Preservative Treatment by Pressure Process -- All Timber Products |
| WCLIB | Standard Grading and Dressing Rules No. 16 of the West Coast Lumber Inspection Bureau |
| WWPA | Standard Grading Rules for Western Lumber, Western Wood Products Association |
| ASTM C 150 | Specification for Portland Cement |
| ASTM C 404 | Specification for Aggregates for Masonry Grout |

SECTION 13300 - BUILDING GENERAL PROVISIONS

APA	American Plywood Association -- Plywood Specification and Grade Guide
ASTM C 36	Specification for Gypsum Wallboard
ASTM C 475	Specifications for Joint Treatment Materials for Gypsum Wallboard Construction

1.4 CONTRACTOR SUBMITTALS

- A. CONTRACTOR shall submit full information on all materials and equipment proposed for use on the project prior to commencement of work. Submittal shall include catalog data, dimension drawings, reinforcing steel and miscellaneous metal shop drawings, material of construction, roofing material, roof truss design information exterior wall form design, concrete mix design, and such descriptive data as may be requested by the ENGINEER.

PART 2 -- PRODUCTS

2.1 REINFORCED CONCRETE

- A. Reinforced Concrete shall be as shown on the Plans and shall meet the requirements of Specification Section 03301. All concrete shall have a minimum 28 day compressive strength of 3,000 psi.

2.2 REINFORCING STEEL

- A. Reinforcing steel shall comply with the requirements of Specification Section 003301 and shall be Grade 60.

2.3 CONCRETE FASTENERS

- A. Anchor bolts for fastening sills, plates, and ledgers to concrete shall be galvanized low-carbon steel bolts conforming to ASTM A 307.
- B. Expansion anchor bolts shall be wedge-expanding type anchors being wholly made of the type of material specified (zinc-plated steel) if no other material specified, such as Red Head Wedge Anchors, manufactured by Phillips Drill Company, or an approved equal.

2.4 EXPANSION JOINT

- A. Expansion Joint shall be a preformed extruded solid section of rubber such as Blok-Tite AA 2003 Control Joint, manufactured by AA Wire Products Company, Chicago, Illinois, or an approved equal.

2.5 LUMBER

- A. Lumber shall be Hem-Fir #2 or better S4S that has been kiln dried to reduce shrinkage. Each piece shall be legibly stamped that the lumber was graded in accordance with the West Coast Lumber Inspection Bureau Grading Rules.

SECTION 13300 - BUILDING GENERAL PROVISIONS

- B. Treated lumber sills, plates, and furring strips in contact with concrete or masonry or as shown on the plans, shall be pressure treated Hem-Fir in accordance with AWWPA C1. Pressure treated lumber shall be pressure treated in accordance with current applicable recommendations of the American Wood Preservers Association "Manual of Recommended Practice," or Federal Specification TT-W-571.
- C. Plywood shall comply with the requirements of the "Plywood Specification and Grade Guide" of the American Plywood Association.

2.6 MISCELLANEOUS METAL

- A. Hurricane ties shall be Simpson H1 Hurricane ties, 18 ga galvanized steel or approved equal.
- B. Simpson No. L-50 shall be 16 ga galvanized steel Simpson L-50 reinforcing angles or approved equal.
- C. Screened strip vent shall be zinc plated or aluminum continuous vents with louvers and insect screen.
- D. Nails shall be common galvanized nails in all locations except for Simpson Hurricane ties and L-50 Reinforcing Angles. Nail sizes shall be in accordance with the 1997 Uniform Building Code. Simpson Teco nails, or approved equal shall be used with reinforcing angles and hurricane ties.

2.7 METAL ROOFING AND SIDING FOR BOILER ROOM ONLY

- A. Metal roofing shall be 24 gauge Klip Rib concealed fastener type system as manufactured by BHP Steel Building Products USA Inc., or approved equal. Base metal shall conform to ASTM A-446 Grade A. A "Zincalume" coating conforming to ASTM A-792 shall be applied to the base metal. Exterior finish shall be a 0.8 mil Polyvinylidene Fluoride, 70% Kynar resin finish coat applied over a 0.2 mil baked on epoxy base primer to a total film thickness of 1.0 mil. Interior finish to be a 0.35 off-white top coat over 0.15 mil primer, or approved equal. Roofing color chips shall be submitted to the ENGINEER. The roofing color shall match the existing roofing. Siding shall be identical to the metal roofing except it shall be a screwed on delta rib pattern and shall be a minimum of 26 gauge.
- B. Ridge cap, ridge flashing and gable end flashing shall be formed from the same material and with the same finish as the attached roof.
- C. Foam closure strips shall be made from closed cell pre-molded neoprene or polyethylene foam.
- D. Manufacturer prefabricated snow stops shall be furnished as shown on the plans in the same color and the same finish selected for the metal roofing.

2.8 DOORS AND HARDWARE

- A. Doors shall be insulated Fiberglass Reinforced Plastic (FRP) Doors and Frames.

SECTION 13300 - BUILDING GENERAL PROVISIONS

- B. Door sizes indicated are nominal.
 - C. Doors shall be as manufactured by the Corrim Company or approved equal.
 - D. Door and frame units to be rigid, neat in appearance and free from defects, warp, or buckle. Fit and assemble units in manufacturer's plant.
 - E. Door Hardware locksets and hinges shall be stainless steel.
- 2.9 OVERHEAD ROLLING DOORS
- A. Overhead rolling doors shall be insulated Aluminum Rolling Overhead Doors with aluminum or stainless steel guides.
 - B. Doors shall be provided with manual chain operation.
 - C. Doors shall be provided with a hood and air baffle weatherstripping. Hoods shall be aluminum or stainless steel.
 - D. All materials furnished with doors shall be corrosion resistant.
 - E. Doors shall be as manufactured by The Cookson Company, Cornell Iron Works, The Overhead Door Corp. or approved equal.
- 2.10 PAINT
- A. Paint shall be of the highest quality (first line product manufactured for the particular purpose for which they are used by Benjamin Moore, Sherwin Williams, Tnemec Company, Inc., Valspar, etc.. The Owner is not bound to approve all types of paint from any one manufacturer. Material for each general purpose shall be of the same manufacturer and materials of different manufacture shall not be used over one another. Color chips shall be submitted to the ENGINEER for selection of the colors to be used. Paint shall conform to the following schedule:
 - Exposed Wood - Acrylic Latex Coating
 - 1st Coat - Tnemec 36-03 Undercoater - 2.0-3.5 mils
 - 2nd Coat - Tnemec 6 Tneme-Cryl - 2.0-3.0 mils
 - 3rd Coat - Tnemec 6 Tneme-Cryl - 2.0-3.0 mils
- 2.11 FRP LAMINATE PANEL
- A. FRP Laminate Panel shall be prelaminated fiberglass panel with ½" plywood and white fiberglass as manufactured by Nudo Products, Inc. or approved equal. The panels shall be provided with edge and corner trim to provide finished edges along all surfaces.
- 2.13 CAULKS AND SEALANTS
- A. Caulk shall be polyurethane caulk manufactured by Sika Corporation ASTM C-920 Type S, Grade NS, Class 25 or approved equal.

SECTION 13300 - BUILDING GENERAL PROVISIONS

PART 3 -- EXECUTION

3.1 CONCRETE

- A. Reinforced concrete shall comply with the requirements of Specification Section 03301.

3.2 EXPANSION ANCHORS

- A. Expansion Anchor Bolts shall not be installed until the concrete or masonry receiving the anchors has reached its design strength. An anchor shall not be installed closer than six times its diameter to either an edge of the concrete or masonry, or to another expansion anchor unless specifically detailed otherwise on the contract drawings.

3.3 DOORS AND HARDWARE

- A. Deliver metal door assemblies cartoned or crated to provide protection during transit and job storage. Inspect upon deliver for damage. Minor damages may be repaired provided items are equal to or better than new work and acceptable to the ENGINEER.
- B. Store doors and frames at the building site under cover. Place units on at least 4" high wood sills or on the floors in a manner that will prevent rust and damage. Avoid use of non-vented plastics or canvas shelter which could create a humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide a 1/4 inch space between stacked doors to promote air circulation.
- C. Install the metal units and accessories in accordance with final shop drawings and manufacturer's data and as specified herein. Set doors accurately in position, plumbed, aligned and straight. Securely fasten frames in position to retain alignment and rigidity during construction.
- D. Doorstops for exterior doors will be installed as soon as the doors are mounted.
- E. Make final adjustments, checks, and readjustments to operating finish hardware items prior to final inspection. Immediately after erecting, sand smooth any rusted or damaged areas of the prime coat, and apply touch-up of compatible air-drying primer.
- F. Position each wall mount door bumper so that it will absorb the impact loads from the door knob. Install concrete anchor according to manufacturer's instructions.

3.4 INSULATION AND VAPOR BARRIER

- A. Wall insulation shall not be installed until after the roof has been installed and not until an approved system of protecting the newly applied insulation from adverse weather has been provided for the wall openings.

SECTION 13300 - BUILDING GENERAL PROVISIONS

- B. Overlap adjoining sheets of vapor barrier by twelve inches (12").
- C. The buried insulation shall be bonded by adhesive. Apply adhesive for all insulation in three continuous beads per board length, minimum 1/8-inch thick. Place board utilizing a method to maximize contact bedding. Make edges and ends tight to adjacent board and to protrusions. Cut and fit insulation tightly around obstructions.

3.5 RESILIENT BASE

- A. The resilient base shall be installed at all interior wall/floor seams. Install base in as long lengths as practicable, with preformed units, or fabricated from base material with mitered or coped intersections. Tightly bond base to backing throughout the length of each piece, with continuous contact at horizontal and vertical surface.

3.6 CARPENTRY

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work for this project.
- B. Examine the areas and conditions under which work of this project will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.
- C. Produce joints which are tight, true and well nailed with members assembled in accordance with the plans and pertinent codes and regulations. Carefully select individual pieces so that knots and obvious defects will not interfere with placing bolts or proper nailing, and will allow making of proper connections. Cut out and discard defects which will render a piece unable to serve its intended function. Lumber may be rejected by the ENGINEER, whether or not it has been installed, for excessive warp, twist, bow, or crook. mildew, fungus, or mold as well as for improper cutting and fitting.
- D. Do not shim any framing component.
- E. In addition to framing operations normal to the fabrication and erection indicated on the plans, install wood blocking and backing required for the work of other trades. Set horizontal and sloped members with the crown up. Do not notch, cut or bore members for pipes, ducts, or conduits or for other reasons except as shown on the plans or as specifically approved in advance by the ENGINEER.
- F. Make bearings full unless otherwise indicated on the plans. Finish bearing surfaces on which structural members rest so as to give sure and even support. Where framing members slope, cut or notch the ends as required to give uniform bearing surface.
- G. Install blocking as required to support items of finish and to cut off concealed draft openings, both vertical and horizontal, between ceiling and floor areas.

SECTION 13300 - BUILDING GENERAL PROVISIONS

- H. Install wood cross bridging (not less than 2" x 3" nominal), metal cross bridging of equal strength, or solid blocking between joists where the span exceeds 8'-0". Provide maximum distance of 8'-0" between a line of bridging and a bearing. Cross bridging may be omitted for roof and ceiling joists where the omission is permitted by code, except where otherwise indicated on the plans. Install solid blocking between joists at points of support and wherever sheathing is discontinuous. Blocking may be omitted where joists are supported on metal hangers.
- I. On framing members to receive a finished surface, align the finish subsurface to vary not more than 1/8" from the plane of surface of adjacent furring and framing members.
- J. Place plywood with face grain perpendicular to supports and continuously over at least two supports, except where otherwise shown on the plans. Center joints accurately over supports, unless otherwise shown on the plans.
- K. Protect plywood from moisture by use of waterproof coverings until the plywood in turn has been covered with the next succeeding component or finish.
- L. Use only galvanized common wire nails, 16 D for dimensioned lumber and 8 D for plywood. Nail without splitting wood. Prebore as required. Remove split members and replace with members complying with the specified requirements.
- M. Drill bolt holes 1/16" larger in diameter than the bolts being used. Drill straight and true from one side only. Use washers under nuts and bolt heads for bearing directly on wood.
- N. For lag screws and wood screws, prebore holes same diameter as root of threads, enlarging holes to shank diameter for length of shank. Screw, do not drive, lag screws and wood screws.
- O. Exterior trim shall have scarf end-joints and mitered corners, unless otherwise detailed on the plans and shall present a neat and orderly appearance. The concealed ends of the members at a joint shall be sealed with a sealer compatible with the specified finish prior to assembly.
- P. Interior trim shall be rigidly secured and shall present a neat and orderly appearance. All corners shall be mitered and all end-joints shall be scarf joints.
- Q. Trim requiring painting shall be secured with finish nails. Nail heads shall be set and filled with putty and all wood surfaces shall be sanded to a smooth surface ready for the paint finish specified.

3.7 METAL ROOFING

- A. Metal roofing shall be installed in accordance with the Manufacturer's recommendations and as shown on the plans.
- B. Remove any strippable coating on the panels and flashings prior to installation.
- C. Caulk seal and fasten roofing to provide a complete weather-tight non-leaking installation.

SECTION 13300 - BUILDING GENERAL PROVISIONS

- D. Touch-up roofing as requested by the ENGINEER using the manufacturer's standard touch-up paint. Follow manufacturer's instructions for the application carefully.
 - E. Roofing with excessive paint damage will be rejected by the ENGINEER.
 - F. Remove excess scrap metal and keep working surface free of debris on a daily basis. Completed roofing systems shall be free from stains and scraps, wash panels if necessary. Completed system shall present a neat and orderly appearance.
- 3.8 PAINT
- A. The following areas or items shall not be painted, unless otherwise specifically indicated herein or called for on the Plans.
 - 1. Portions of metal embedded in concrete except where aluminum is in contact with concrete.
 - 2. Stainless steel, brass, bronze, glass, PVC, or aluminum.
 - 3. Piping buried underground, electrical control equipment, instruments, fixtures, and manufactured equipment with baked enamel finish provided the color supplied matches the specified color where required.
 - 4. Concealed electrical conduits and exposed electrical conduits at all non-submerged locations.
 - B. Paint all exposed, wood surfaces, and masonry.
 - C. It is the responsibility of the CONTRACTOR and the painting trade to see that all surfaces are prepared in accordance with the printed directions and recommendations of the paint manufacturer whose product is to be applied to a given surface.
 - D. Remove, mask, or otherwise protect hardware, lighting fixtures, switch plates, aluminum surfaces, machined surfaces, nameplates on machinery, stainless steel, nuts and bolts, restraining rods, and other surfaces not intended to be painted. Provide drop cloths to prevent paint materials from falling on or marring any adjacent surfaces. Protect working parts of all mechanical and electrical equipment from damage during surface preparation and painting process.
 - E. Prepare surfaces for painting in conformance with the paint manufacturer's printed directions and recommendations and these Specifications. Surfaces shall be dry and thoroughly cleaned of foreign materials. Before applying any coating, inspect the surface for defects which would cause paint failure or result in an unsightly surface. Defects shall be filled or removed so that the surfaces are in proper condition for painting. Any remaining defects shall be brought to the attention of the ENGINEER in writing. If the CONTRACTOR elects to ignore an unsuitable surface condition and applies his coat(s), he will be held responsible to refinish the work at his own expense.
 - F. Manufacturer's written instructions for applying each type of paint or protective coating shall be furnished the ENGINEER by the CONTRACTOR before application is begun. Apply all coatings in accordance with the paint

SECTION 13300 - BUILDING GENERAL PROVISIONS

manufacturer's recommendations and as approved by the ENGINEER. Sufficient time shall be allowed between coats to assure thorough drying of previously applied paint. All prime coats (excluding those for metal surfaces) shall be applied by brush and the coating thoroughly worked into the surface. Material delivered to the job with a shop prime coat shall be touched up as required to recoat all abraded areas prior to receiving any additional coatings. Paint shall not be applied in extreme cold, in dust- or smoke-laden air, or in rainy weather.

- G. Work shall be free of runs, bridges, shiners, laps, or other imperfections due to faulty workmanship. The CONTRACTOR shall assume all responsibility for preventing settling of dust or any other improper condition while paint is setting and to repair any damaged coats at no additional cost to the Owner. Coated items shall not be shipped, installed, or assembled until the coatings have thoroughly cured.
- H. Where two successive coats of the same color paint are to be applied, the first coat shall be of a slightly different shade to differentiate it from the second coat. Undercoats shall be tinted to approximate final color. Paint coverage per gallon shall not exceed the area recommended by the manufacturer, and the coverage shall be reduced when, in the opinion of the ENGINEER, a reduction is necessary to ensure satisfactory protection to surfaces, uniform color, and satisfactory surface appearance. Where the paint manufacturer provides a dry film thickness (DFT) per coat, the thickness shall not be less than that recommended by the manufacturer or as specified herein.
- I. All cloths and cotton waste that might constitute a fire hazard shall be placed in closed metal containers or destroyed at the end of each day. Upon completion of the work, all staging, scaffolding, and containers shall be removed from the site or destroyed in an approved manner. Paint spots, oil, or stains upon adjacent surfaces and floors shall be completely removed, and the entire job left clean and acceptable.
- J. The CONTRACTOR shall give the ENGINEER three days advance notice of the start of any surface preparation work or coating application work.
- K. Work which has been performed in the absence of the ENGINEER without his prior approval, or work which is not performed in compliance with the procedures set forth in these Specifications, will be rejected.
- L. Inspection by the ENGINEER, or the waiver of inspection of any particular portion of work, shall not be construed to relieve the CONTRACTOR of his responsibility to perform the work in accordance with these Specifications.

END OF SECTION

SECTION 15020 - PIPE SUPPORTS

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall provide all tools, supplies, materials, equipment, and all labor necessary for the furnishing, construction, and installation of all pipe supports, hangers, guides, and anchors shown, specified, or required for a complete and operable piping system, in accordance with the requirements of the Contract Documents.
- B. All materials that will be in contact with potable water shall be NSF 61 and NSF 372 listed.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 11120 Piping, Valves, Fittings and Miscellaneous Equipment

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Commercial Standards:

ANSI/ASME B31.1	Power Piping.
ASTM A 123	Specifications for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

1.4 CONTRACTOR SUBMITTALS

- A. **Shop Drawings:** The CONTRACTOR shall furnish complete shop drawings of all pipe supports, hangers, anchors, and guides, as well as calculations for special supports and anchors, in accordance with Section 01300, "Contractor Submittals."

PART 2 -- PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. **Code Compliance:** All piping systems and pipe connections to equipment shall be properly supported, to prevent undue deflection, vibration, and stresses on piping, equipment, and structures. All supports and parts thereof shall conform to the requirements of ANSI/ASME B31.1, except as supplemented or modified by these Specifications. Supports for plumbing piping shall be in accordance with the latest edition of the applicable plumbing code, or local administration requirements.
- B. **Structural Members:** Wherever possible, pipes shall be attached to structural. Where it is necessary to frame structural members between existing members, such supplementary members shall be provided by the CONTRACTOR at no additional cost to the OWNER. All supplementary members shall be in accordance with the requirements of the building code and the American Institute of Steel Construction.
- C. The 16" pipe inside the water filtration building shall be supported with free standing supports braced to the exterior wall. Supports shall be hot dip galvanized Unistrut Telestrut Tubing with base plates or approved equal.

SECTION 15020 - PIPE SUPPORTS

C. Small diameter pipe (6" and smaller shall be supported by galvanized Unistrut with Unistrut Cush-A-Clamps, or approved qual, primarily mounted to the ceiling. Floor mounted supports shall be Unistrut Telestrut Tubing with base plates or approve equal.

C. **Support Spacing:** Supports for piping with the longitudinal axis in approximately a horizontal position shall be spaced to prevent excessive sag, bending and shear stresses in the piping, with special consideration given where components, such as flanges and valves, impose concentrated loads. Where calculations are not made or more stringent requirements from pipe manufacturers prevail, suggested maximum spacing of supports are given in the tables below. Vertical supports shall be spaced to prevent the pipe from being overstressed from the combination of all loading effects.

1. Support for Steel Pipe and Cast Iron Pipe:

Pipe Size (inches)	Maximum Span (feet)
1/2	6
3/4 & 1	8
1-1/4 to 2	10
3	12
4	14
6	17
8 & 10	19
12 & 14	23
16 & 18	25
20 & Above	30

2. Support Spacing for Copper Tubing:

Pipe Size (inches)	Maximum Span (feet)
1/2 to 1-1/2	6
2 to 4	10
6 & Above	12

3. Support Spacing for Schedule 80 PVC Pipe:

Pipe Size (inches)	Maximum Span (feet)
1/2	4
3/4	4.5
1	5
1-1/4	5.5
1-1/2	5.75
2	6.25
3	7.5
4	8.25
6	10
8	11
10	12.25
12	13.25

SECTION 15020 - PIPE SUPPORTS

4. Support Spacing for Ductile Iron Pipe:

Pipe Size (inches)	Maximum Span (feet)
All Sizes	2 Supports per length or 10 feet (one of the two supports located at joint)

5. Variances: For temperatures other than ambient temperatures, or those listed, and for other piping materials or wall thicknesses, the above spacings should be modified in accordance with the pipe manufacturer's recommendations.

D. **Pipe Hangers:** Pipe hangers shall be capable of supporting the pipe in all conditions of operation. They shall allow for free expansion and contraction of the piping, and shall prevent excessive stress on equipment. All hangers shall have a means of vertical adjustment after erection. Hangers shall be designed so that they cannot become disengaged by any movement of the supported pipe. Hangers subject to shock, seismic disturbances, or thrust imposed by the actuation of safety valves, shall include hydraulic shock suppressors. All hanger rods shall be subject to tensile loading, only.

E. **Hangers Subject to Horizontal Movements:** At hanger locations where lateral or axial movement is anticipated, suitable linkage shall be provided to permit such movement. Where horizontal pipe movement is greater than 1/2-inch, or where the hanger rod deflection from the vertical is greater than 4 degrees from the cold to the hot position of the pipe, the hanger rod and structural attachment shall be offset in such a manner that the rod is vertical in the hot position.

F. **Freestanding Piping:** Free-standing pipe connections to equipment, like chemical feeders, pumps, etc., shall be firmly attached to fabricated steel frames made of angles, channels, or I-beams anchored to the structure. Exterior, free-standing overhead piping shall be supported on fabricated pipe stands, consisting of pipe columns anchored to concrete footings, with horizontal, welded steel angles and U-bolts or clamps, securing the pipes.

G. **Point Loads:** Any meters, valves, heavy equipment, and other point loads on PVC, fiber glass, and other plastic pipes, shall be supported on both sides, according to manufacturer's recommendations to avoid undue pipe stresses and failures. To avoid point loads, all supports on plastic and fiber glass piping shall be equipped with extra wide pipe saddles or galvanized steel shields.

H. **Noise Reduction:** To reduce transmission of noise in piping systems, all copper tubes in buildings and structures shall be wrapped with a 2-inch wide strip of rubber fabric or similar, suitable material, at each pipe support, bracket, clip, or hanger.

I. **Seismic Restaint:** Pipe hangers shall be capable of supporting the pipe in all conditions of operation for piping in Seismic Zone 3. They shall allow for free expansion and contraction of the piping, and shall prevent excessive stress on equipment. Hangers shall be designed and installed so that the piping and equipment are not damaged by seismic action.

2.2 MANUFACTURED SUPPORTS

SECTION 15020 - PIPE SUPPORTS

A. **Stock Parts:** Where not specifically shown or detailed, designs, generally accepted as exemplifying good engineering practice, using stock or production parts, shall be utilized wherever possible. Such parts shall be locally available, new, of best commercial quality, designed and rated for the intended purpose.

B. **Manufacturers, or Equal:**

1. **Unistrut**

2.3 COATING

A. **Galvanizing:** Unless otherwise shown or specified, all fabricated pipe supports, other than stainless steel or non-ferrous supports, shall be blast-cleaned after fabrication and hot-dip galvanized in accordance with ASTM 123.

B. **Other Coatings:** Other than stainless steel or non-ferrous supports, all supports shall receive protective coatings in accordance with the requirements of Section 09800, "Protective Coating."

PART 3 -- EXECUTION

3.1 INSTALLATION

A. **General:** All pipe supports, hangers, brackets, anchors, guides, and inserts shall be fabricated and installed in accordance with the manufacturer's printed instructions and ANSI/ASME B31.1. All concrete inserts for pipe hangers and supports shall be coordinated with the formwork.

B. **Appearance:** Pipe supports and hangers shall be positioned in such a way as to produce an orderly, neat piping system. All hanger rods shall be vertical, without offsets. Hangers shall be adjusted to line up groups of pipes at the proper grade for drainage and venting, as close to ceilings or roofs as possible, without interference with other work.

3.2 FABRICATION

A. **Quality Control:** Pipe hangers and supports shall be fabricated and installed by experienced welders and fitters, using the best welding procedures available. Fabricated supports shall be neat in appearance without sharp corners, burrs, and edges.

- END OF SECTION -

SECTION 16060 - GROUNDING AND BONDING

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 grounding and bonding systems and equipment.

1.3 ACTION SUBMITTALS

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

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Burndy; Part of Hubbell Electrical Systems.
 2. Dossert; AFL Telecommunications LLC.
 3. ERICO International Corporation.
 4. Fushi Copperweld Inc.
 5. Galvan Industries, Inc.; Electrical Products Division, LLC.
 6. Harger Lightning and Grounding.
 7. ILSCO.
 8. O-Z/Gedney; A Brand of the EGS Electrical Group.
 9. Robbins Lightning, Inc.
 10. Siemens Power Transmission & Distribution, Inc.

SECTION 16060 - GROUNDING AND BONDING

2.2 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

2.3 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
 - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
 - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
 - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
- C. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- D. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.

2.4 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel; 5/8 by 96 inches (16 by 2400 mm).

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install stranded conductors unless otherwise indicated.
- B. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Connections to Structural Steel: Welded connectors.

SECTION 16060 - GROUNDING AND BONDING

3.2 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including heaters, dampers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
- C. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

3.3 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may
- B. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
 - 3. Use high compression connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- C. Grounding and Bonding for Piping:
 - 1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
- D. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.
- E. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet (18 m) apart.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Hangers and supports for electrical equipment and systems.
- B. Related Sections include the following:
- C. EMT: Electrical metallic tubing.
- D. IMC: Intermediate metal conduit.
- E. RMC: Rigid metal conduit.

1.3 PERFORMANCE REQUIREMENTS

- A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- C. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Steel slotted support systems.
 - 2. Nonmetallic slotted support systems.

1.5 **QUALITY ASSURANCE**

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.
 - c. ERICO International Corporation.
 - d. GS Metals Corp.
 - e. Thomas & Betts Corporation.
 - f. Unistrut; Atkore International.
 - g. Wesanco, Inc.
 2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 3. Channel Dimensions: Selected for applicable load criteria.
- B. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch- (14-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c., in at least 1 surface.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.
 - c. Fabco Plastics Wholesale Limited.
 - d. Seasafe, Inc.
 2. Fittings and Accessories: Products of channel and angle manufacturer and designed for use with those items.
 3. Fitting and Accessory Materials: Same as channels and angles, except metal items shall be stainless steel.
 4. Rated Strength: Selected to suit applicable load criteria.
- C. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- D. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway to be supported.

SECTION 16073 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

- E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; galvanized.
- F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Hilti, Inc.
 - 2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
 - 3) MKT Fastening, LLC.
 - 4) Simpson Strong-Tie Co., Inc.
 - 2. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Cooper B-Line, Inc.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti, Inc.
 - 4) ITW Ramset/Red Head; Illinois Tool Works, Inc.
 - 5) MKT Fastening, LLC.
 - 3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
 - 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
 - 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
 - 6. Toggle Bolts: All-steel springhead type.
 - 7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for IMC and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 - 1. Secure raceways and cables to these supports with single-bolt conduit clamps.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, IMC and RMC may be supported by openings through structure members, as permitted in NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Existing Concrete: Expansion anchor fasteners.
 - 4. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
 - 5. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts or Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
 - 6. To Light Steel: Sheet metal screws.
 - 7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- B. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Identification for conductors.
 - 2. Underground-line warning tape.
 - 3. Warning labels and signs.
 - 4. Equipment identification labels.
 - 5. Miscellaneous identification products.

1.3 QUALITY ASSURANCE

- A. Comply with ANSI A13.1.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.4 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

PART 2 - PRODUCTS

2.1 CONDUCTOR IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.
- B. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil- (0.08-mm-) thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the conductor diameter such that the clear shield overlaps the entire printed legend.
- C. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tube with machine-printed identification label. Sized to suit diameter of and shrinks to fit firmly around conductor it identifies. Full shrink recovery at a maximum of 200 deg F (93 deg C). Comply with UL 224.
- D. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
- E. Write-On Tags: Polyester tag, 0.015 inch (0.38 mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
 - 1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2.2 FLOOR MARKING TAPE

- A. 2-inch- (50-mm-) wide, 5-mil (0.125-mm) pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

2.3 UNDERGROUND-LINE WARNING TAPE

- 1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical lines.
- 2. Printing on tape shall be permanent and shall not be damaged by burial operations.
- 3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.
- B. Color and Printing:
 - 1. Comply with ANSI Z535.1 through ANSI Z535.5.

2.4 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.

SECTION 16075 – ELECTRICAL IDENTIFICATION

- B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

2.5 INSTRUCTION SIGNS

- A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. inches (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.
 - 1. Engraved legend with black letters on white face.
 - 2. Punched or drilled for mechanical fasteners.
 - 3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.
- B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and UV-resistant seal for label.

2.6 EQUIPMENT IDENTIFICATION LABELS

- A. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).
- B. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

2.7 CABLE TIES

- A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, Type 6/6 nylon.
 - 1. Minimum Width: 3/16 inch (5 mm).
 - 2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi (82.7 MPa).
 - 3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
 - 4. Color: Black except where used for color-coding.
- B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, Type 6/6 nylon.
 - 1. Minimum Width: 3/16 inch (5 mm).
 - 2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi (82.7 MPa).
 - 3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
 - 4. Color: Black.

2.8 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- D. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- E. Attach plastic raceway and cable labels that are not self-adhesive type with clear vinyl tape with adhesive appropriate to the location and substrate.
- F. Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.
- G. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
 - 1. Outdoors: UV-stabilized nylon.
- H. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches (400 mm) overall.

3.2 IDENTIFICATION SCHEDULE

- A. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
 - 1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded feeder and branch-circuit conductors.
 - a. Color shall be factory applied or may be field applied for sizes larger than No. 8 AWG.
 - b. Colors for 120-240-V Circuits:
 - 1) Phase A: Black.
 - 2) Phase B: Orange (High Leg).

SECTION 16075 – ELECTRICAL IDENTIFICATION

- 3) Phase C: Blue.
- c. Colors for 480/277-V Circuits:
 - 1) Phase A: Brown.
 - 2) Phase B: Orange.
 - 3) Phase C: Yellow.
 - d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- B. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.
 - C. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, use write-on tags with the conductor or cable designation, origin, and destination.
 - D. Control-Circuit Conductor Termination Identification: For identification at terminations provide heat-shrink preprinted tubes, or self-adhesive, self-laminating vinyl labels with the conductor designation.
 - E. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
 1. Install underground-line warning tape for cables in raceway.
 - F. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
 - G. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.
 1. Comply with 29 CFR 1910.145.
 2. Identify system voltage with black letters on an orange background.
 3. Apply to exterior of door, cover, or other access.
 4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:
 - a. Controls with external control power connections.
 - H. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
 - I. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control

SECTION 16075 – ELECTRICAL IDENTIFICATION

panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:
 - a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
 - b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
 - c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
 - d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment to Be Labeled:
 - a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be engraved, laminated acrylic or melamine label.
 - b. Enclosures and electrical cabinets.
 - c. Enclosed switches.
 - d. Enclosed circuit breakers.
 - e. Enclosed controllers.
 - f. Variable-speed controllers.
 - g. Push-button stations.

END OF SECTION

SECTION 16120 – CONDUCTORS AND CABLES

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. Building wires and cables rated 600 V and less.
 - 2. Connectors, splices, and terminations rated 600 V and less.
- B. Related Requirements:
 - 1. Section 16123 "Control-Voltage Electrical Power Cables" for control systems communications cables and Classes 1, 2 and 3 control cables.

1.3 DEFINITIONS

- A. VFC: Variable frequency controller.

1.4 ACTION SUBMITTALS

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

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Alcan Products Corporation; Alcan Cable Division.
 - 2. Alpha Wire.
 - 3. Belden Inc.

SECTION 16120 – CONDUCTORS AND CABLES

4. Encore Wire Corporation.
 5. General Cable Technologies Corporation.
 6. Southwire Incorporated.
- B. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.
- C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type XHHW-2.
- D. Multiconductor Cable: Comply with NEMA WC 70/ICEA S-95-658 for Type SO with ground wire.
- E. VFC Cable:
1. Comply with UL 1277, UL 1685, and NFPA 70 for Type TC-ER cable.
 2. Type TC-ER with oversized crosslinked polyethylene insulation, spiral-wrapped foil plus 85 percent coverage braided shields and insulated full-size ground wire, and sunlight- and oil-resistant outer PVC jacket.
 3. Comply with UL requirements for cables in Classes I, Division 2 hazardous location applications.

2.2 CONNECTORS AND SPLICES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. AFC Cable Systems, Inc.
 2. Gardner Bender.
 3. Hubbell Power Systems, Inc.
 4. Ideal Industries, Inc.
 5. Ilsco; a branch of Bardes Corporation.
 6. NSi Industries LLC.
 7. O-Z/Gedney; a brand of the EGS Electrical Group.
 8. 3M; Electrical Markets Division.
 9. Tyco Electronics.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Stranded copper.
- B. Branch Circuits: Stranded copper, except VFC cable, which shall be extra flexible stranded.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Exposed Feeders: Type XHHW-2, single conductors in raceway.
- B. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway.
- C. Exposed Branch Circuits: Type XHHW-2, single conductors in raceway.
- D. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway.
- E. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.
- F. VFC Output Circuits: Type XHHW-2 in metal conduit or Type TC-ER cable with braided shield.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Complete raceway installation between conductor and cable termination points according to Section 16130 "Raceways and Boxes" prior to pulling conductors and cables.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material.
 - 1. Use oxide inhibitor in each splice, termination, and tap.

SECTION 16120 – CONDUCTORS AND CABLES

- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

3.5 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 16075 "Electrical Identification."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test feeder conductors for compliance with requirements.
 - 2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.
 - a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 6 months after date of Substantial Completion.
 - b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
- B. Test and Inspection Reports: Prepare a written report to record the following:
 - 1. Procedures used.
 - 2. Results that comply with requirements.
 - 3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- C. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. UTP cabling.
 - 2. RS-485 cabling.
 - 3. Low-voltage control cabling.
 - 4. Control-circuit conductors.
 - 5. Identification products.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.
- C. UTP: Unshielded twisted pair.

1.4 ACTION SUBMITTALS

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

1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 PERFORMANCE REQUIREMENTS

- A. Flame Travel and Smoke Density for Cables in Non-Riser Applications and Non-Plenum Building Spaces: As determined by testing identical products according to UL 1685.

2.3 UTP CABLE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ADC.
2. Alpha Wire Company; a division of Belden Inc.
3. Belden Inc.
4. CommScope, Inc.
5. Draka Cableteq USA.
6. Genesis Cable Products; Honeywell International, Inc.
7. Mohawk; a division of Belden Inc.
8. Nexans; Berk-Tek Products.
9. Siemon Company (The).
10. Superior Essex Inc.
11. SYSTIMAX Solutions; a CommScope, Inc. brand.
12. 3M.
13. Tyco Electronics/AMP Netconnect; Tyco International Ltd.

- B. Description: 100-ohm, four-pair UTP.

1. Comply with ICEA S-90-661 for mechanical properties of Category 5e cables.
2. Comply with TIA-568-C.1 for performance specifications.
3. Comply with TIA-568-C.2, Category 5e.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:
 - a. Communications, General Purpose: Type CM or Type CMG.
 - b. Communications, General Purpose: Type CM, Type CMG, Type CMP, Type CMR, or Type CMX in metallic conduit installed per NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."
 - c. Communications, Limited Purpose: Type CMX.

2.4 UTP CABLE HARDWARE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ADC.
2. American Technology Systems Industries, Inc.
3. Belden Inc.
4. Dynacom Inc.
5. Hubbell Incorporated.
6. Leviton Commercial Networks Division.

SECTION 16123 – CONTROL-VOLTAGE ELECTRICAL POWER CABLES

7. Molex Premise Networks; a division of Molex, Inc.
 8. Panduit Corp.
 9. Siemon Company (The).
 10. Tyco Electronics/AMP Netconnect; Tyco International Ltd.
- B. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-C.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.
- C. Connecting Blocks: 110-style IDC for Category 5e . Provide blocks for the number of cables terminated on the block.
- D. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.
1. Number of Terminals per Field: One for each conductor in assigned cables.
- E. Jacks and Jack Assemblies: 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular. Comply with TIA/EIA-568-C.1.

2.5 RS-485 CABLE

- A. Standard Cable: NFPA 70, Type CMG.
1. Paired, twisted, No. 22 AWG, stranded (7x30) tinned-copper conductors.
 2. PVC insulation.
 3. Unshielded.
 4. PVC jacket.
 5. Flame Resistance: Comply with UL 1685.

2.6 LOW-VOLTAGE CONTROL CABLE

- A. Paired Cable: NFPA 70, Type CMG.
1. Multi-pair, twisted, No. 16 AWG, stranded (19x29) tinned-copper conductors.
 2. PVC insulation.
 3. Unshielded.
 4. PVC jacket.
 5. Flame Resistance: Comply with UL 1685.

2.7 CONTROL-CIRCUIT CONDUCTORS

- A. Class 1 Control Circuits: Stranded copper, Type XHHW-2, in raceway, complying with UL 44.
- B. Class 2 Control Circuits: Stranded copper, Type XHHW-2, in raceway, complying with UL 44.
- C. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type XHHW-2, in raceway, complying with UL 44.

2.8 SOURCE QUALITY CONTROL

- A. Factory test UTP cables according to TIA-568-C.2.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Test cables on receipt at Project site.
 - 1. Test each pair of UTP cable for open and short circuits.

3.2 INSTALLATION OF RACEWAYS AND BOXES

- A. Comply with requirements in Section 16130 "Raceways and Boxes" for raceway selection and installation requirements for boxes, conduits, and wireways as supplemented or modified in this Section.
 - 1. Outlet boxes shall be no smaller than 2 inches (50 mm) wide, 3 inches (75 mm) high, and 2-1/2 inches (64 mm) deep.
- B. Comply with TIA-569-B for pull-box sizing and length of conduit and number of bends between pull points.
- C. Install manufactured conduit sweeps and long-radius elbows if possible.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Comply with NECA 1 and NFPA 70.
- B. General Requirements for Cabling:
 - 1. Comply with TIA-568-C Series of standards.
 - 2. Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems".
 - 3. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
 - 4. Cables may not be spliced.
 - 5. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
 - 6. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems". Install lacing bars and distribution spools.
 - 7. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.

SECTION 16123 – CONTROL-VOLTAGE ELECTRICAL POWER CABLES

8. Cold-Weather Installation: Bring cable to room temperature before dereeling. Do not use heat lamps for heating.
9. Pulling Cable: Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems".
10. Secure: Fasten securely in place with hardware specifically designed and installed so as to not damage cables.

C. UTP Cable Installation:

1. Comply with TIA-568-C.2.
2. Do not untwist UTP cables more than 1/2 inch (12 mm) at the point of termination to maintain cable geometry.

D. Installation of Control-Circuit Conductors:

1. Install wiring in raceways. Comply with requirements specified in Section 16130 "Raceways and Boxes."

E. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA-569-B recommendations for separating unshielded copper voice and data communications cable from potential EMI sources including electrical power lines and equipment.
2. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
 - a. Electrical Equipment or Circuit Rating Less Than 2 kVA: No requirement.
 - b. Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 3 inches (75 mm).
 - c. Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 6 inches (150 mm).
3. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or 5 HP and Larger: A minimum of 48 inches (1200 mm).
4. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).

3.4 REMOVAL OF CONDUCTORS AND CABLES

- A. Remove abandoned conductors and cables. Abandoned conductors and cables are those installed that are not terminated at equipment and are not identified for future use with a tag.

3.5 CONTROL-CIRCUIT CONDUCTORS

A. Minimum Conductor Sizes:

1. Class 1 remote-control and signal circuits; No 14 AWG.
2. Class 2 low-energy, remote-control, and signal circuits; No. 16 AWG.

SECTION 16123 – CONTROL-VOLTAGE ELECTRICAL POWER CABLES

3. Class 3 low-energy, remote-control, alarm, and signal circuits; No 12 AWG.

3.6 GROUNDING

- A. For data communication wiring, comply with ANSI-J-STD-607-A and with BICSI TDMM, "Bonding and Grounding (Earthing)" Chapter.
- B. For low-voltage control wiring and cabling, comply with requirements in Section 16060 "Grounding and Bonding."

3.7 IDENTIFICATION

- A. Comply with requirements for identification specified in Section 16075 "Electrical Identification."
- B. Identify data and communications system components, wiring, and cabling according to TIA-606-A; label printers shall use label stocks, laminating adhesives, and inks complying with UL 969.

3.8 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 1. Visually inspect UTP cable jacket materials for UL or third-party certification markings. Inspect cabling terminations to confirm color-coding for pin assignments, and inspect cabling connections to confirm compliance with TIA-568-C.1.
 2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
 3. Test UTP cabling for direct-current loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not after cross-connection.
- B. Document data for each measurement.
- C. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Metal conduits, tubing, and fittings.
 - 2. Nonmetal conduits, tubing, and fittings.
 - 3. Metal wireways and auxiliary gutters.
 - 4. Boxes, enclosures, and cabinets.
 - 5. Handholes and boxes for exterior underground cabling.

1.3 DEFINITIONS

- A. GRC: Galvanized rigid steel conduit.
- B. IMC: Intermediate metal conduit.

1.4 ACTION SUBMITTALS

- A. Product Data: For wireways and fittings, hinged-cover enclosures, and cabinets.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Allied Tube & Conduit.
 - 3. Anamet Electrical, Inc.
 - 4. Electri-Flex Company.
 - 5. O-Z/Gedney.
 - 6. Picoma Industries.
 - 7. Republic Conduit.
 - 8. Robroy Industries.
 - 9. Southwire Company.
 - 10. Thomas & Betts Corporation.

SECTION 16130 – RACEWAYS AND BOXES

11. Western Tube and Conduit Corporation.
 12. Wheatland Tube Company.
- B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. GRC: Comply with ANSI C80.1 and UL 6.
- D. IMC: Comply with ANSI C80.6 and UL 1242.
- E. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- F. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
- G. Joint Compound for IMC or GRC,: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. AFC Cable Systems, Inc.
 2. Anamet Electrical, Inc.
 3. Arcco Corporation.
 4. CANTEX Inc.
 5. CertainTeed Corporation.
 6. Condux International, Inc.
 7. Electri-Flex Company.
 8. Kraloy.
 9. Lamson & Sessions; Carlon Electrical Products.
 10. Niedax-Kleinhuis USA, Inc.
 11. RACO; Hubbell.
 12. Thomas & Betts Corporation.
- B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. RNC: Type EPC-40 or 80-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- D. LFNC: Comply with UL 1660.
- E. RTRC: Comply with UL 1684A and NEMA TC 14.

SECTION 16130 – RACEWAYS AND BOXES

- F. Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
- G. Fittings for LFNC: Comply with UL 514B.
- H. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Cooper B-Line, Inc.
 - 2. Hoffman.
 - 3. Mono-Systems, Inc.
 - 4. Square D.
- B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.
 - 1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Wireway Covers: Screw fastened type unless otherwise indicated.
- E. Finish: Manufacturer's standard enamel finish.

2.4 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Adalet.
 - 2. Cooper Technologies Company; Cooper Crouse-Hinds.
 - 3. EGS/Appleton Electric.
 - 4. Erickson Electrical Equipment Company.
 - 5. FSR Inc.
 - 6. Hoffman.
 - 7. Hubbell Incorporated.
 - 8. Kraloy.
 - 9. Milbank Manufacturing Co.
 - 10. Mono-Systems, Inc.
 - 11. O-Z/Gedney.
 - 12. RACO; Hubbell.
 - 13. Robroy Industries.

SECTION 16130 – RACEWAYS AND BOXES

14. Spring City Electrical Manufacturing Company.
 15. Stahlin Non-Metallic Enclosures.
 16. Thomas & Betts Corporation.
 17. Wiremold / Legrand.
- B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
- D. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 lb (23 kg) shall be listed and marked for the maximum allowable weight.
- E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- F. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.
- G. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep).
- H. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover unless otherwise indicated.
1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 2. Nonmetallic Enclosures: Plastic.
 3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.
- I. Cabinets:
1. NEMA 250, Type 12 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 2. Hinged door in front cover with concealed hinge.
 3. Metal barriers to separate wiring of different systems and voltage.

2.5 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

- A. General Requirements for Handholes and Boxes:
1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
 2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.

SECTION 16130 – RACEWAYS AND BOXES

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Armorcast Products Company.
 - b. Carson Industries LLC.
 - c. NewBasis.
 - d. Oldcastle Precast, Inc.
 - e. Quazite: Hubbell Power System, Inc.
 - f. Synertech Moulded Products.
2. Standard: Comply with SCTE 77.
3. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
6. Cover Legend: Molded lettering, "ELECTRIC."
7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

2.6 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

- A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.
 1. Tests of materials shall be performed by an independent testing agency.
 2. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012 and traceable to NIST standards.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
 1. Exposed Conduit: GRC.
 2. Underground Conduit: RNC, Type EPC-80-PVC, direct buried.
 3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFNC.
 4. Boxes and Enclosures, Aboveground: NEMA 250, Type 4.
- B. Indoors: Apply raceway products as specified below unless otherwise indicated:
 1. Exposed: GRC or IMC.
 2. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFNC.
 3. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

SECTION 16130 – RACEWAYS AND BOXES

- C. Minimum Raceway Size: 3/4-inch (21-mm) trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
 - 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
 - 2. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

3.2 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Comply with requirements in Section 16073 "Hangers and Supports for Electrical Systems" for hangers and supports.
- E. Arrange stub-ups so curved portions of bends are not visible above finished slab or grade.
- F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.
- G. Support conduit within 12 inches (300 mm) of enclosures to which attached.
- H. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- I. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- J. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- K. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- L. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

SECTION 16130 – RACEWAYS AND BOXES

- M. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- N. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- O. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. Install raceway sealing fittings according to NFPA 70.
- P. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
 - 1. Where required by NFPA 70.
- Q. Comply with manufacturer's written instructions for solvent welding RNC and fittings.
- R. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 36 inches (915 mm) of flexible conduit for luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
 - 1. Use LFMC in damp or wet locations subject to severe physical damage.
 - 2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
- S. Mount boxes at heights indicated on Drawings.
- T. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

- A. Direct-Buried Conduit:
 - 1. Excavate trench bottom to provide firm and uniform support for conduit.
 - 2. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 02300 "Earthwork."
 - 3. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
 - a. Couple steel conduits to ducts with adapters designed for this purpose.
 - b. For stub-ups where conduits penetrate buildings, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of foundation. Install insulated grounding bushings on terminations at equipment.

SECTION 16130 – RACEWAYS AND BOXES

4. Underground Warning Tape: Comply with requirements in Section 16075 "Electrical Identification."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.
- C. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

END OF SECTION

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. Receptacles, receptacles with integral GFCI, and associated device plates.
 - 2. Twist-locking receptacles.
 - 3. Weather-resistant receptacles.
 - 4. Snap switches.
 - 5. Wall-switch occupancy sensors.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

1.4 ACTION SUBMITTALS

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

1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.
- C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
 - 1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
 - 2. Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

2.4 GFCI RECEPTACLES

- A. General Description:
 - 1. Straight blade, non-feed-through type.
 - 2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
 - 3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.
- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

2.5 HAZARDOUS (CLASSIFIED) LOCATION RECEPTACLES

- A. Wiring Devices for Hazardous (Classified) Locations: Comply with NEMA FB 11 and UL 1010.

2.6 TWIST-LOCKING RECEPTACLES

- A. Single Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 and UL 498.

2.7 TOGGLE SWITCHES

- A. Comply with NEMA WD 1, UL 20, and FS W-S-896.
- B. Switches, 120/277 V, 20 A:
- C. Pilot-Light Switches, 20 A:
 - 1. Description: Single pole, with neon-lighted handle, illuminated when switch is "off."

2.8 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Bryant Electric.
 - 2. Cooper Industries, Inc.
 - 3. Hubbell Building Automation, Inc.
 - 4. Leviton Manufacturing Co., Inc.
 - 5. Lightolier Controls.
 - 6. Lithonia Lighting; Acuity Brands Lighting, Inc.
 - 7. Lutron Electronics Co., Inc.
 - 8. NSi Industries LLC; TORK Products.
 - 9. RAB Lighting.
 - 10. Sensor Switch, Inc.
 - 11. Square D.
 - 12. Watt Stopper.
- B. General Requirements for Sensors: Automatic-wall-switch occupancy sensor, suitable for mounting in a single gang switchbox.
 - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 2. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F (0 to 49 deg C).
 - 3. Switch Rating: Not less than 800-VA fluorescent at 120 V, 1200-VA fluorescent at 277 V, and 800-W incandescent.
- C. Wall-Switch Sensor Tag WS2:
 - 1. Standard Range: 210-degree field of view, with a minimum coverage area of 900 sq. ft. (84 sq. m).
 - 2. Sensing Technology: PIR.
 - 3. Switch Type: SP, field selectable automatic "on," or manual "on" automatic "off."
 - 4. Voltage: 120 V; passive-infrared type.
 - 5. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
 - 6. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.

SECTION 16140 – WIRING DEVICES

2.9

2.10 WALL PLATES

- A. Single and combination types shall match corresponding wiring devices.
 - 1. Plate-Securing Screws: Metal with head color to match plate finish.
 - 2. Material for Unfinished Spaces: Galvanized steel.
 - 3. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

2.11 FINISHES

- A. Device Color:
 - 1. Wiring Devices Connected to Normal Power System: Gray, unless otherwise indicated or required by NFPA 70 or device listing.
- B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B. Conductors:
 - 1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
 - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
 - 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
 - 4. Existing Conductors:
 - a. Cut back and pigtail, or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtailling existing conductors is permitted, provided the outlet box is large enough.
- C. Device Installation:
 - 1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.

SECTION 16140 – WIRING DEVICES

2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

D. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the left.

E. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

F. Dimmers:

1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

H. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Test Instruments: Use instruments that comply with UL 1436.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.

SECTION 16140 – WIRING DEVICES

6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.
- C. Wiring device will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes separately enclosed, preassembled, combination VFCs, rated 600 V and less, for speed control of three-phase, squirrel-cage induction motors.

1.3 DEFINITIONS

- A. CE: Conformance Europeene (European Compliance).
- B. CPT: Control power transformer.
- C. EMI: Electromagnetic interference.
- D. LED: Light-emitting diode.
- E. NC: Normally closed.
- F. NO: Normally open.
- G. OCPD: Overcurrent protective device.
- H. PID: Control action, proportional plus integral plus derivative.
- I. RFI: Radio-frequency interference.
- J. VFC: Variable-frequency motor controller.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type and rating of VFC indicated.
 - 1. Include dimensions and finishes for VFCs.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: For each VFC indicated.
 - 1. Include mounting and attachment details.

SECTION 16269 – VARIABLE-FREQUENCY MOTOR CONTROLLERS

2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each VFC from manufacturer.
- B. Source quality-control reports.
- C. Field quality-control reports.
- D. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For VFCs to include in operation and maintenance manuals.
 1. Include the following:
 - a. Manufacturer's written instructions for setting field-adjustable timers, controls, and status and alarm points.
 - b. Load-Current and List of Settings of Adjustable Overload Relays: Compile after motors have been installed, and arrange to demonstrate that switch settings for motor-running overload protection suit actual motors to be protected.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. If stored in space that is not permanently enclosed and air conditioned, remove loose packing and flammable materials from inside controllers.
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for VFCs, including clearances between VFCs, and adjacent surfaces and other items.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace VFCs that fail in materials or workmanship within specified warranty period.
 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Rockwell Automation, Inc; Allen-Bradley Brand.
 2. Schneider Electric USA, Inc.
 3. Siemens Energy & Automation, Inc.

2.2 SYSTEM DESCRIPTION

- A. General Requirements for VFCs:
1. VFCs and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Comply with NEMA ICS 7, NEMA ICS 61800-2, and UL 508A.
- B. Application: Variable torque.
- C. VFC Description: Variable-frequency motor controller, consisting of power converter that employs pulse-width-modulated inverter, factory built and tested in an enclosure, with integral disconnecting means and overcurrent and overload protection; listed and labeled by an NRTL as a complete unit; arranged to provide self-protection, protection, and variable-speed control of single or three-phase induction motors by adjusting output voltage and frequency.
1. Units suitable for operation of NEMA MG 1, Design A and Design B motors, as defined by NEMA MG 1, Section IV, Part 30, "Application Considerations for Constant Speed Motors Used on a Sinusoidal Bus with Harmonic Content and General Purpose Motors Used with Adjustable-Voltage or Adjustable-Frequency Controls or Both."
 2. Units suitable for operation of inverter-duty motors as defined by NEMA MG 1, Section IV, Part 31, "Definite-Purpose Inverter-Fed Polyphase Motors."
 3. Listed and labeled for integrated short-circuit current (withstand) rating by an NRTL acceptable to authorities having jurisdiction.
- D. Design and Rating: Match load type, such as fans, blowers, and pumps; and type of connection used between motor and load such as direct or through a power-transmission connection.
- E. Output Rating: 10 to 60 Hz, with voltage proportional to frequency throughout voltage range; maximum voltage equals input voltage.
- F. Unit Operating Requirements:
1. Input AC Voltage Tolerance: Plus 10 and minus 15 percent of VFC input voltage rating.
 2. Input AC Voltage Unbalance: Not exceeding 5 percent.
 3. Input Frequency Tolerance: Plus or minus 3 percent of VFC frequency rating.
 4. Minimum Efficiency: 96 percent at 60 Hz, full load.

SECTION 16269 – VARIABLE-FREQUENCY MOTOR CONTROLLERS

5. Minimum Displacement Primary-Side Power Factor: 95 percent under any load or speed condition.
 6. Minimum Short-Circuit Current (Withstand) Rating: 10 kA.
 7. Ambient Temperature Rating: Not less than 32 deg F (0 deg C) and not exceeding 104 deg F (40 deg C).
 8. Humidity Rating: Less than 95 percent (noncondensing).
 9. Altitude Rating: Not exceeding 3300 feet (1000 m).
 10. Vibration Withstand: Comply with NEMA ICS 61800-2.
 11. Overload Capability: 1.5 times the base load current for 60 seconds; minimum of 1.8 times the base load current for three seconds.
 12. Starting Torque: Minimum 100 percent of rated torque from 3 to 60 Hz.
 13. Speed Regulation: Plus or minus 10 percent.
- G. Inverter Logic: Microprocessor based, 16 bit, isolated from all power circuits.
- H. Internal Adjustability Capabilities:
1. Minimum Speed: 5 to 25 percent of maximum rpm.
 2. Maximum Speed: 80 to 100 percent of maximum rpm.
 3. Acceleration: 0.1 to 999.9 seconds.
 4. Deceleration: 0.1 to 999.9 seconds.
 5. Current Limit: 30 to minimum of 150 percent of maximum rating.
- I. Self-Protection and Reliability Features:
1. Surge Suppression: Factory installed as an integral part of the VFC, complying with UL 1449 SPD, Type 1 or Type 2.
 2. Loss of Input Signal Protection: Selectable response strategy, including speed default to a percent of the most recent speed, a preset speed, or stop; with alarm.
 3. Under- and overvoltage trips.
 4. Inverter overcurrent trips.
 5. VFC and Motor-Overload/Overtemperature Protection: Microprocessor-based thermal protection system for monitoring VFCs and motor thermal characteristics, and for providing VFC overtemperature and motor-overload alarm and trip; settings selectable via the keypad.
 6. Instantaneous line-to-line and line-to-ground overcurrent trips.
 7. Loss-of-phase protection.
 8. Reverse-phase protection.
 9. Short-circuit protection.
- J. Automatic Reset/Restart: Attempt three restarts after drive fault or on return of power after an interruption and before shutting down for manual reset or fault correction; adjustable delay time between restart attempts.
- K. Integral Input Disconnecting Means and OCPD: NEMA KS 1, nonfusible switch, with pad-lockable, door-mounted handle mechanism.
1. Disconnect Rating: Not less than 115 percent of VFC input current rating.

2.3 CONTROLS AND INDICATION

- A. Status Lights: Door-mounted LED indicators displaying the following conditions:
 - 1. Power on.
 - 2. Run.
 - 3. Overvoltage.
 - 4. Line fault.
 - 5. Overcurrent.
 - 6. External fault.
- B. Control: Manually adjustable speed control.
- C. Historical Logging Information and Displays:
 - 1. Real-time clock with current time and date.
 - 2. Running log of total power versus time.
 - 3. Total run time.
 - 4. Fault log, maintaining last four faults with time and date stamp for each.
- D. Indicating Devices: Digital display mounted on VFC and connected to display VFC parameters including, but not limited to:
 - 1. Output frequency (Hz).
 - 2. Motor speed (rpm).
 - 3. Motor status (running, stop, fault).
 - 4. Motor current (amperes).
 - 5. Motor torque (percent).
 - 6. Fault or alarming status (code).
 - 7. Set point frequency (Hz).
 - 8. Motor output voltage (V ac).

2.4 LINE CONDITIONING AND FILTERING

- A. Input Line Conditioning: Based on the manufacturer's harmonic analysis study and report, provide input filtering, as required, to limit total demand (harmonic current) distortion and total harmonic voltage demand at the defined point of common coupling to meet IEEE 519 recommendations.

2.5 OPTIONAL FEATURES

- A. Damper control circuit with end-of-travel feedback capability.
- B. Remote Indicating Circuit Terminals: Mode selection, controller status, and controller fault.

2.6 ENCLOSURES

- A. VFC Enclosures: NEMA 250, to comply with environmental conditions at installed location.

SECTION 16269 – VARIABLE-FREQUENCY MOTOR CONTROLLERS

1. Dry and Clean Indoor Locations: Type 1.

2.7 SOURCE QUALITY CONTROL

- A. Testing: Test and inspect VFCs according to requirements in NEMA ICS 61800-2.
 1. Test each VFC while connected to a motor that is comparable to that for which the VFC is rated.
 2. Verification of Performance: Rate VFCs according to operation of functions and features specified.
- B. VFCs will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, surfaces, and substrates to receive VFCs, with Installer present, for compliance with requirements for installation tolerances, and other conditions affecting performance of the Work.
- B. Examine VFC before installation. Reject VFCs that are wet, moisture damaged, or mold damaged.
- C. Examine roughing-in for conduit systems to verify actual locations of conduit connections before VFC installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Wall-Mounting Controllers: Install with tops at uniform height and with disconnect operating handles not higher than 79 inches (2000 mm) above finished floor, unless otherwise indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall. For controllers not on walls, provide freestanding racks complying with Section 16073 "Hangers and Supports for Electrical Systems."
- B. Comply with NECA 1.

3.3 IDENTIFICATION

- A. Identify VFCs, components, and control wiring. Comply with requirements for identification specified in Section 16075 "Electrical Identification."
 1. Label each VFC with engraved nameplate.

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each VFC element, bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Tests and Inspections:
 - 1. Inspect VFC, wiring, components, connections, and equipment installation. Test and adjust controllers, components, and equipment.
 - 2. Test insulation resistance for each VFC element, component, connecting motor supply, feeder, and control circuits.
 - 3. Test continuity of each circuit.
 - 4. Verify that voltages at VFC locations are within 10 percent of motor nameplate rated voltages. If outside this range for any motor, notify Owner before starting the motor(s).
 - 5. Test each motor for proper phase rotation.
 - 6. Perform tests according to the Inspection and Test Procedures for Adjustable Speed Drives stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 7. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 - 8. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. VFCs will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies the VFC and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations made after remedial action.

3.5 STARTUP SERVICE

- A. Perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.

3.6 ADJUSTING

- A. Program VFC for required operational sequences, status indications, alarms, event recording, and display features. Clear events memory after final acceptance testing and prior to Substantial Completion.

SECTION 16269 – VARIABLE-FREQUENCY MOTOR CONTROLLERS

3.7 PROTECTION

- A. Replace VFCs whose interiors have been exposed to water or other liquids prior to Substantial Completion.

3.8 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, reprogram, and maintain VFCs.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes the following enclosed controllers rated 600 V and less:
 - 1. Full-voltage manual.
- B. Related Section:
 - 1. Section 16269 "Variable-Frequency Motor Controllers" for general-purpose, ac, adjustable-frequency, pulse-width-modulated controllers for use on variable torque loads in ranges up to 200 hp.

1.3 DEFINITIONS

- A. CPT: Control power transformer.
- B. MCCB: Molded-case circuit breaker.
- C. MCP: Motor circuit protector.
- D. N.C.: Normally closed.
- E. N.O.: Normally open.
- F. OCPD: Overcurrent protective device.
- G. SCR: Silicon-controlled rectifier.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of enclosed controller. Include manufacturer's technical data on features, performance, electrical characteristics, ratings, and enclosure types and finishes.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

SECTION 16420 – ENCLOSED CONTROLLERS

- B. Comply with NFPA 70.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store enclosed controllers indoors in clean, dry space with uniform temperature to prevent condensation. Protect enclosed controllers from exposure to dirt, fumes, water, corrosive substances, and physical damage.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).
 2. Altitude: Not exceeding 6600 feet (2010 m).

1.8 COORDINATION

- A. Coordinate layout and installation of enclosed controllers with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 FULL-VOLTAGE CONTROLLERS

- A. General Requirements for Full-Voltage Controllers: Comply with NEMA ICS 2, general purpose, Class A.
- B. Motor-Starting Switches: "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off or on.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - b. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - c. Rockwell Automation, Inc.; Allen-Bradley brand.
 - d. Siemens Energy & Automation, Inc.
 - e. Square D; a brand of Schneider Electric.
 2. Configuration: Nonreversing.
 3. Surface mounting.
 4. Red LED pilot light.

SECTION 16420 – ENCLOSED CONTROLLERS

2.2 ENCLOSURES

- A. Enclosed Controllers: NEMA ICS 6, to comply with environmental conditions at installed location.
 - 1. Dry and Clean Indoor Locations: Type 1.
 - 2. Hazardous Areas Indicated on Drawings: Type 7.

2.3 ACCESSORIES

- A. General Requirements for Control Circuit and Pilot Devices: NEMA ICS 5; factory installed in controller enclosure cover unless otherwise indicated.
 - 1. Push Buttons, Pilot Lights, and Selector Switches: Heavy-duty, oiltight type.
 - a. Push Buttons: Shielded types; momentary as indicated.
 - b. Pilot Lights: LED types; colors as indicated.
 - c. Selector Switches: Rotary type.
- B. Reversible N.C./N.O. auxiliary contact(s).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and surfaces to receive enclosed controllers, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine enclosed controllers before installation. Reject enclosed controllers that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Wall-Mounted Controllers: Install enclosed controllers on walls with tops at uniform height unless otherwise indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall. For controllers not at walls, provide freestanding racks complying with Section 16073 "Hangers and Supports for Electrical Systems."
- B. Install heaters in thermal overload relays. Select heaters based on actual nameplate full-load amperes after motors have been installed.
- C. Comply with NECA 1.

SECTION 16420 – ENCLOSED CONTROLLERS

3.3 IDENTIFICATION

- A. Identify enclosed controllers, components, and control wiring. Comply with requirements for identification specified in Section 16075 "Electrical Identification."
 - 1. Label each enclosure with engraved nameplate.

3.4 PROTECTION

- A. Replace controllers whose interiors have been exposed to water or other liquids prior to Substantial Completion.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Lighting and appliance branch-circuit panelboards.

1.3 DEFINITIONS

- A. SVR: Suppressed voltage rating.
- B. TVSS: Transient voltage surge suppressor.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
 - 2. Detail enclosure types and details for types other than NEMA 250, Type 1.
 - 3. Detail bus configuration, current, and voltage ratings.
 - 4. Short-circuit current rating of panelboards and overcurrent protective devices.
 - 5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 - 6. Include wiring diagrams for power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

- A. Field Quality-Control Reports:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

SECTION 16442 - PANELBOARDS

- B. Panelboard Schedules: For installation in panelboards.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For panelboards and components to include in operation and maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. 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.
- D. Comply with NEMA PB 1.
- E. Comply with NFPA 70.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.
- B. Handle and prepare panelboards for installation according to NEMA PB 1.

1.9 PROJECT CONDITIONS

- A. Environmental Limitations:
 - 1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
 - 2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - a. Ambient Temperature: Not exceeding 23 deg F (minus 5 deg C) to plus 104 deg F (plus 40 deg C).
 - b. Altitude: Not exceeding 6600 feet (2000 m).
- B. Service Conditions: NEMA PB 1, usual service conditions, as follows:
 - 1. Ambient temperatures within limits specified.

SECTION 16442 - PANELBOARDS

2. Altitude not exceeding 6600 feet (2000 m).
- C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
 1. Notify Owner no fewer than five days in advance of proposed interruption of electric service.
 2. Do not proceed with interruption of electric service without Owner's written permission.
 3. Comply with NFPA 70E.

1.10 COORDINATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

1.11 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.
 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

- A. Enclosures: Surface-mounted cabinets.
 1. Rated for environmental conditions at installed location.
 - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
 2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions.
 3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
 4. Finishes:
 - a. Panels and Trim: Galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
 - b. Back Boxes: Same finish as panels and trim.

SECTION 16442 - PANELBOARDS

5. Directory Card: Inside panelboard door, mounted in metal frame with transparent protective cover.
- B. Incoming Mains Location: Top.
- C. Phase, Neutral, and Ground Buses:
 1. Material: Tin-plated aluminum.
 2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
- D. Conductor Connectors: Suitable for use with conductor material and sizes.
 1. Material: Tin-plated aluminum.
 2. Main and Neutral Lugs: Mechanical type.
 3. Ground Lugs and Bus-Configured Terminators: Mechanical type.
- E. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- F. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 3. Siemens Energy & Automation, Inc.
 4. Square D; a brand of Schneider Electric.
- B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Mains: lugs only.
- D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.3 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

SECTION 16442 - PANELBOARDS

2. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
3. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
4. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
 - c. Ground-Fault Protection: Integrally mounted relay and trip unit.
 - d. Handle Padlocking Device: Fixed attachment for locking circuit-breaker handle in off position.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.
- B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.
- C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install panelboards and accessories according to NEMA PB 1.1.
- B. Mount top of trim 90 inches (2286 mm) above finished floor unless otherwise indicated.
- C. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- D. Install overcurrent protective devices not already factory installed.
- E. Install filler plates in unused spaces.
- F. Arrange conductors in gutters into groups and bundle and wrap with wire ties.
- G. Comply with NECA 1.

3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 16075 "Electrical Identification."

SECTION 16442 - PANELBOARDS

- B. Create a directory to indicate installed circuit loads. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 16075 "Electrical Identification."

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 - 3. Perform the following infrared scan tests and inspections and prepare reports:
 - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
 - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 6 months after date of Substantial Completion.
 - c. Instruments and Equipment:
 - 1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
- D. Panelboards will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

- A. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.

SECTION 16442 - PANELBOARDS

3.6 PROTECTION

- A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION

SECTION 16511 – INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior lighting fixtures, lamps, and drivers.
 - 2. Emergency lighting units.
 - 3. Exit signs.
 - 4. Lighting fixture supports.

1.3 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color-rendering index.
- C. LER: Luminaire efficacy rating.
- D. Lumen: Measured output of lamp and luminaire, or both.
- E. Luminaire: Complete lighting fixture, including driver if provided.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
 - 1. Physical description of lighting fixture including dimensions.
 - 2. Emergency lighting units including battery and charger.
 - 3. Driver.
 - 4. Energy-efficiency data.
 - 5. Life, output (lumens, CCT, and CRI).
 - 6. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing & Calculation Guides, of each lighting fixture type.
 - a. Testing Agency Certified Data: For indicated fixtures, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining fixtures shall be certified by manufacturer.

SECTION 16511 – INTERIOR LIGHTING

1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.
- B. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For lighting equipment and fixtures to include in operation and maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.
- 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 NFPA 70.

1.8 WARRANTY

- A. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period for Emergency Lighting Unit Batteries: 10 years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining nine years.
 - 2. Warranty Period for Self-Powered Exit Sign Batteries: Seven years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining six years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide product indicated on Drawings.

2.2 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

- A. LED Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5A.

SECTION 16511 – INTERIOR LIGHTING

- B. Metal Parts: Free of burrs and sharp corners and edges.
- C. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.
- D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit maintenance.
- E. Diffusers and Globes:
 - 1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - 2. Glass: Annealed crystal glass unless otherwise indicated.
- F. Factory-Applied Labels: Comply with UL 1598. Include recommended light engines and drivers. Labels shall be located where they will be readily visible to service personnel.

2.3 DRIVERS FOR LED SOURCED LUMINAIRES

- A. General Requirements for Electronic Drivers:
 - 1. Exterior Environmental Protection: IP66 outdoor rated.
 - 2. Designed for type and quantity of lamps served.
 - 3. Drivers shall be designed for full light output unless dimmer control is indicated.
 - 4. Drivers shall operate at 60 Hz.
 - 5. Sound Rating: Class A.
 - 6. Output Voltage Regulation: 1 percent Line and 5 percent Load.
 - 7. Total Harmonic Distortion Rating: Less than 20 percent.
 - 8. Current Crest Factor: 1.5, maximum.
 - 9. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
 - 10. Lower operating frequencies are available but may interfere with default ballasts when used in proximity of infrared sensors.
 - 11. Efficiency: 90 percent, or higher.

2.4 EXIT SIGNS

- A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.
- B. Internally Lighted Signs:
 - 1. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.
 - 2. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
 - a. Battery: Sealed, maintenance-free, nickel-cadmium type.
 - b. Charger: Fully automatic, solid-state type with sealed transfer relay.
 - c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored,

SECTION 16511 – INTERIOR LIGHTING

relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.

- d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
- e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

2.5 EMERGENCY LIGHTING UNITS

- A. General Requirements for Emergency Lighting Units: Self-contained units complying with UL 924.
 - 1. Battery: Sealed, maintenance-free, lead-acid type.
 - 2. Charger: Fully automatic, solid-state type with sealed transfer relay.
 - 3. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
 - 4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 - 5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
 - 6. Wire Guard: Heavy-chrome-plated wire guard protects lamp heads or fixtures.

2.6 LIGHTING FIXTURE SUPPORT COMPONENTS

- A. Comply with Section 16073 "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.
- C. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Lighting fixtures:
 - 1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.
- B. Temporary Lighting: If it is necessary, and approved by Owner to use permanent luminaires for temporary lighting, install and energize the minimum number of luminaires necessary. When construction is sufficiently complete, remove the temporary luminaires, disassemble, clean thoroughly, and reinstall.

SECTION 16511 – INTERIOR LIGHTING

- C. Suspended Lighting Fixture Support:
 - 1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
- D. Connect wiring according to Section 16120 "Conductors and Cables."

3.2 FIELD QUALITY CONTROL

- A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.
- B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION

SECTION 22 05 10 - GENERAL MECHANICAL-PLUMBING

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. The Mechanical Work is governed by the entire Specifications and not just Division 22. The entire Specifications must be examined for requirements relating to the Work hereunder. The Work covered by this and all other Mechanical sections consists of furnishing labor, equipment, and materials in accordance with the Specifications or Drawings, or both, together with any incidental items not shown or specified which can be reasonably inferred or taken as belonging to the Work and necessary in good practice to provide a complete system described or shown as intended.
- B. Coordinate shutdown of systems with OWNER.
- C. Continuity of Mechanical Systems for the Building: Continuity of Mechanical systems for building sprinkler, plumbing, heating, and ventilation systems during demolition and new work shall be the responsibility of the Contractor. Building sprinkler, plumbing, heating, and ventilation systems shall be operational during occupied periods. Shutdown of systems shall not affect Occupied portions of the building except when coordinated with the OWNER. Sprinkler, plumbing, heating, and ventilation systems shall be active at all times in Occupied areas. Temporary mechanical systems and connections, provided by the Contractor, shall be necessary during project phasing, demolition, and new Work as required to provide continuity of sprinkler, plumbing, heating, and ventilation systems. All temporary mechanical systems shall be the responsibility of the Contractor. All temporary equipment, ductwork, piping, and related appurtenances shall be removed prior to substantial completion.
- D. Demolition of and Connection to Existing Material, Equipment, and Systems:
 - 1. Mechanical drawings show reported as-built and contract document locations of underground piping taken from past project drawings. Contractor to determine actual existing locations of underground piping as needed without additional cost to the Owner. Contractor to utilize pipe location devices as needed. Contact Owner if actual piping locations are different than shown. Excavation shall be required to locate piping, remove piping, install piping, and connect to existing piping.
 - 2. Where select piping and ductwork systems are shown to be partially removed for connection, prepare and protect the connection points appropriately to ensure later continuity of Work. Contractor shall provide all temporary supports as required and completely replace material and equipment that are not suitably protected during construction and becomes damaged.
 - 3. All material and equipment that are to be removed for relocation is the Contractors responsibility to suitably protect and store in a location that protects from damage. Contractor shall completely replace all relocated material and equipment that are damaged from storage and other misuse between demolition and reinstallation.

SECTION 22 05 10 - GENERAL MECHANICAL-PLUMBING

4. Where items are shown to be removed such as piping or ductwork it is to be assumed that this includes the removal of the respective system including but not limited to pipe and duct hangers, supports, conduit, wiring, valves, and other related trim and appurtenances. Piping to be removed through a floor assumes that the piping is to be capped below floor and the floor finished smooth.
5. Concrete wall and floor penetrations required. Saw cut or core drill as required. Sleeve penetrations. Coordinate with Structural Engineer for structural beam penetration approvals.
6. All plumbing fixtures and trim located in the respective Work area is to be cleaned thoroughly prior to occupancy by Owner.

1.2 WORDING OF THE SPECIFICATIONS

- A. These Specifications are of the abbreviated or streamlined type and frequently include incomplete sentences. However, periods are used for clarity. Words such as "shall", "shall be", "the Contractor shall", and similar mandatory phrases shall be supplied by inference in the same manner, as they are required for the notes on the drawings.

1.3 CODES AND REGULATIONS

- A. All Work hereunder shall be strictly in conformance with applicable codes and regulations. All Work shall be in accordance with the 2009 Uniform Plumbing Code, 2009 International Mechanical Code, 2009 International Building Code, 2009 International Fire Code, the most recent edition of NFPA, Borough of Haines and State of Alaska code modifications insofar as minimum requirements are concerned, but the Drawings and Specifications shall govern in case the minimum requirements are exceeded. All electrical equipment shall bear the UL label.

1.4 SUBMITTALS

- A. General: Provide submittals according to Conditions of Contract, Division 1 Specifications Sections, and as required hereunder. Drawings and general provisions of the Contract, including General, Supplementary Conditions, and all Division 1 Specification Sections, apply to this Section. Approval of the data shall not eliminate responsibility for compliance with the Drawings or Specifications unless specific attention has been called in writing to proposed deviations at the time of transmittal of the data and such deviations have been approved, nor shall it eliminate the responsibility for freedom of errors of any sort in the data. All Mechanical submittal data for Project construction is to be turned in for approval at the same time in order for an efficient review process. Partial submittals may be rejected until the full submittal is received.

SECTION 22 05 10 - GENERAL MECHANICAL-PLUMBING

- B. Specified Products: Trade names and catalog numbers of manufactured products included herein are intended to indicate the type, size, and grade of quality of equipment and materials required and such equipment and materials are approved for installation, subject to full compliance with the Specifications. Except where single manufacture is specified for standardization, requests for approval of other manufacturers than those specified must be accompanied by complete descriptions including overall dimensions, performance data, and, if catalog material, identification of specific products or items proposed.
- C. Submittal Format: All data shall be submitted at one time in neatly bound loose-leaf three ring binders with pockets or digitally submitted as PDF and tabulated in the same order of Specification Division section. All data shall be typed, minimum 10 point font, no exceptions. Data submitted that is not conforming to these specification requirements will be returned without reviewing and will need to be resubmitted at Contractors sole complete cost.
1. Each binder shall have a set of separators with index tabs A to Z. Tabs are to be printed type. Slip-in tabs not acceptable.
 2. The first page shall be a cover sheet with project name, address, date, submittal product name, all applicable contractors and contact information, and all applicable consultants and contact information.
 3. Second page shall be a submittal manual index of all project Specification sections with respective tab numbers, and respective book number, if applicable.
 4. The first page of each manuals section shall be an index of that respective project Specification section and number with each product name, manufacturer name and model number.
 5. Each manuals section shall be labeled and certified by mechanical Subcontractor that the data presented is in accordance with project Specifications. Index sheet in front of completed binder listing each piece of equipment or material submitted.
 6. Product Data to be utilized shall be flagged and noted and all other data shall be crossed out or otherwise flagged that it is not in the project.
 7. Data shall be inserted in binders in order of Specification number. Specification number shall be clearly labeled on each submittal page.
- D. As-built Drawings: As-built drawings shall be required from all Mechanical Subcontractors and shall accurately show all changes from Contract Documents for all piping, ductwork, and equipment. As-built drawings shall show all underground piping whether changed or not, dimensioned from building lines. As-built drawings shall be updated daily and available for inspection on-site by the Architect.

SECTION 22 05 10 - GENERAL MECHANICAL-PLUMBING

- E. Operating and Maintenance Data: Provide a minimum of three hard copies and one electronic copy. The following data shall be provided to the Architect for approval 30 days prior to the request for Commissioning or Substantial Completion inspection, whichever comes first. Except for the valve directory and nameplate directory, the data shall be provided complete at one time. Partial or separate data will be returned for completion. The valve directory and nameplate directory may be provided for approval previous to the other data. The first section of the O&M manual shall be as listed in the following subparagraphs in order presented hereunder. All of the following subparagraphs sections shall be furnished with permanent plastic see through covers. See requirements under 1.4.C for additional submittal and formatting requirements.
1. Cover and Index sheets as in 1.4.C. above.
 2. Description of systems and operating instructions: The Contractor shall prepare a brief type written description of all new and modified systems, explaining how the systems operate and indicating the proper settings of controls and switches. The instructions are to include all information required for the proper settings of controls and switches. The instructions are to include all information required for the proper operation of the systems. Technical knowledge on controls or adjustments requiring specialized technicians should not be included in the instructions.
 3. Nameplate directory: List of all new boilers, air handlers, fans, expansion tanks, pumps, unit heaters, and other equipment nameplates, giving manufacturer's nameplate data, nameplate designation, location of equipment, area served, switch location, and normal position of the switch. Motor data must include the horsepower, voltage, full load amperage, phase, etc. See Section 220553 - Mechanical Identification.
 4. Manufacturers' literature: Manufacturers' instructions for operation and maintenance of all mechanical equipment and specialties, including replacement parts lists, capacity curves or charts, equipment data sheets, manufacturers' literature on the equipment, and as-built wiring diagrams and control drawings, all suitable for side binding to 8-1/2 x 11 inch size. All data not applicable to the job is to be crossed out or deleted. Manuals turned in for review with non-applicable data not crossed out shall be returned to the Contractor.
 5. Maintenance instructions: Typewritten instructions for the maintenance of the systems, listing each service required on all of the mechanical equipment, including inspections, lubrication, cleaning, checking, and all other operations required. The list is to include all types of bearings installed on the equipment and the type of lubricant required.
 6. Maintenance schedule: List of each item of mechanical equipment requiring inspection, lubrication, cleaning, or service including the type of bearings and type of lubricating means for each piece of equipment. Each item of equipment is to be listed separately with the service required. List to include the times during the year when such inspection and maintenance shall be performed. The specific maintenance required shall be referenced back to the maintenance instructions.

SECTION 22 05 10 - GENERAL MECHANICAL-PLUMBING

7. Valve directory: Indicating valve number, size, location, function, and normal position for each numbered valve. The directory shall be provided and approved before installation of the valve tags. A sample arrangement will be furnished upon request. Two copies required for the preliminary list. See Section 220553 - Mechanical Identification.
- F. Instructions To Personnel and Training: The mechanical Subcontractor shall instruct operating personnel in the operation and maintenance of the systems before accepting the responsibility of operation and maintenance of the systems. Each training session shall be signed off by Project Manager.
- G. Qualification Data: For sheet metal installers. For pipe fitters.
- H. Submit prior to Substantial Completion Inspection and Final Inspection a detailed list of equipment and systems that will not be completed for the completion date. Include status and information of deficiencies from all previous inspection reports.
- I. Submit prior to Re-inspections of Substantial Completion Inspections, if applicable, and the Final Inspection a marked copy of the previous Engineers Inspection Reports detailing all items that have been completed and all items that have not been completed with reasons thereof. Re-inspection or Final Inspection will not occur until receipt of this list.

1.5 COOPERATIVE WORK

- A. The Work hereunder shall be coordinated between various mechanical Sections and with the Work specified under other divisions or contracts toward rapid completion of the entire Project. If any cooperative Work must be altered due to lack of proper supervision hereunder, or failure to make proper provisions in time, then the Work hereunder shall include all expense of such changes as are necessary to be made in the Work under other divisions and contracts, and such changes shall be directly supervised by the Architect and shall be made to the satisfaction of the Architect.
- B. In general pitched piping and ductwork shall take preference in location within the Project area. Coordination of all drain valves, duct access doors, and other equipment requiring access and maintenance procedures is required with all building components during construction for maximum accessibility and proper location as intended. In many portions of the building, piping mains, piping branches, and sprinkler piping, as well as some duct branches will need to be installed in the joist space to allow for installation of duct mains. Coordinate closely with all other Contractors.

SECTION 22 05 10 - GENERAL MECHANICAL-PLUMBING

- C. Protection of existing mechanical material and equipment during selective demolition shall be the responsibility of the Contractor and coordinated with the respective Contractors. The Contractor shall provide temporary supports for all material and equipment. The Contractor at no cost to the Owner shall replace any existing material or equipment damaged during selective demolition due to insufficient protection. Coordination with all disciplines is required.
- D. Temporary Utilities: The Contractor shall be responsible for providing and maintaining the Mechanical Systems serving occupied areas of the building throughout Construction. Shutdown of systems shall not affect Occupied portions of the building except when coordinated with OWNER. Sprinkler, plumbing, heating, and ventilation systems shall be active at all times in Occupied areas.
 - 1. Air handling units may not be utilized for ventilating or heating portions of the building where Construction Work is in progress. All unused ducts are to be sealed air tight into Construction Area. Any duct found dirty will be cleaned immediately at the expense of the Contractor.
 - 2. Protection of existing mechanical material and equipment during selective demolition shall be the responsibility of the Contractor and coordinated with the respective Sub Contractor. The Contractor shall provide temporary supports for all material and equipment. The Contractor at no cost to Owner shall replace any existing materials or equipment damaged during selective demolition due to insufficient protection. Coordinate with all disciplines and phasing plans are required.

1.6 QUALITY ASSURANCE

- A. Perform Work in conformance with all applicable codes, regulations, local ordinances, contract documents, and generally accepted good practice. If discrepancies exist between Specifications and Contract Drawings then the solution that provides the Owner with the highest quality of product or installation shall be deemed as intended by the Contract Documents.
- B. All sheet metal workers shall have a minimum documented sheet metal fabrication and installation experience in commercial or industrial facilities of 3 years or be enrolled in an Alaska Department of Labor approved Sheet Metal Apprentice program. The ratio of on-site workers shall not exceed 3 apprentices or sheet metal workers for every one foreman. A foreman is defined as a sheet metal worker with minimum 3 years experience as detailed above or is an approved Journeyman.
- C. All Plumbers and Pipe Fitters shall have a minimum documented installation experience in commercial or industrial facilities of 3 years or be enrolled in an Alaska Department of Labor approved Plumbers and Pipe Fitters Apprentice program. The ratio of on-site workers shall not exceed 2 apprentices or pipe fitters for every one Journeyman.

SECTION 22 05 10 - GENERAL MECHANICAL-PLUMBING

1.7 FIELD MEASUREMENTS

- A. Verifications: All measurements shall be verified at the site and prior to fabrications of equipment and systems. The existing conditions shall be fully observed before beginning the Work hereunder, and the Work hereunder executed in full coordination with the existing conditions observed. All Work performed with hazardous materials not approved by the Owner shall be at the full responsibility of the contractor and not the Owner.
- B. Changes: Variations apparently necessary due to existing conditions shall be made only on approval in writing by the Architect.

1.8 WARRANTY

- A. The contractor shall provide continuous and generally trouble-free operation of the mechanical systems for the time period of one year after Substantial Completion whichever time period is longer. The operation and maintenance of systems other than incidental operations such as room thermostat settings or changing of air filters, shall be the sole responsibility of the contractor and shall be addressed by the contractor immediately if deficiencies are present. Leaking of valves, flanges, or air vents shall be addressed immediately by the contractor during the warranty period. Control settings, noise problems, and other deficiencies resulting in unsatisfactory environmental conditions shall be addressed immediately.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 22 0510

SECTION 22 05 53- IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Pipe Markers.

1.2 RELATED REQUIREMENTS

- A. Section 09 9000 - Painting and Coating: Identification painting.

1.3 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers; 2007.
- B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2001 (Reapproved 2007).

1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- C. Product Data: Provide manufacturers catalog literature for each product required.
- D. Manufacturer's Installation Instructions: Indicate special procedures, and installation.
- E. Project Record Documents: Record actual locations of tagged valves.

PART 2 - PRODUCTS

2.1 NAMEPLATES

- A. Manufacturers:
 - 1. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
 - 2. Seton Identification Products: www.seton.com.
 - 3. Substitutions: See Section 01 6000 - Product Requirements.
- B. Description: Laminated three-layer plastic with engraved letters.

SECTION 22 05 53- IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

1. Letter Color: White.
2. Letter Height: 1/4 inch.
3. Background Color: Black.
4. Plastic: Conform to ASTM D709.

2.2 TAGS

A. Manufacturers:

1. Advanced Graphic Engraving: www.advancedgraphicengraving.com.
2. Brady Corporation: www.bradycorp.com.
3. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
4. Seton Identification Products: www.seton.com.
5. Substitutions: See Section 01 6000 - Product Requirements.

B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

C. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.3 PIPE MARKERS

A. Manufacturers:

1. Brady Corporation: www.bradycorp.com.
2. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
3. MIFAB, Inc.: www.mifab.com.
4. Seton Identification Products: www.seton.com.
5. Substitutions: See Section 01 6000 - Product Requirements.

B. Comply with ASME A13.1.

C. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

PART 3 - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

SECTION 22 05 53- IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

- B. Symbols, numbers, and all mechanical identification shall match and be in accordance with Contract Documents.

3.2 INSTALLATION

- A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- E. Use tags on piping 3/4 inch diameter and smaller.
 - 1. Identify service, flow direction, and pressure.
 - 2. Install in clear view and align with axis of piping.
 - 3. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.
- F. Identify air handling units, fans, heat pumps, pumps, boilers, water heaters, heat transfer equipment, heat exchangers, tanks, backflow preventers, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.
- G. Identify valves in main and branch piping with tags.
- H. Identify piping, concealed or exposed, with plastic pipe markers or plastic tape pipe markers.
 - 1. Plastic pipe markers are to be used on uninsulated piping only.
 - 2. Identify service, flow direction, and pressure.
 - 3. Install in clear view and align with axis of piping.
 - 4. Locate identification not to exceed 15 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.
 - 5. Inaccessible piping need not be identified if piping is identified at nearest accessible or exposed locations.
 - 6. Install identifying devices after completion of coverings and painting.

END OF SECTION 22 0553

SECTION 221005 - PLUMBING PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Pipe, pipe fittings, valves, and connections for piping systems.
 - 1. Sanitary sewer.
 - 2. Domestic water.

1.2 RELATED REQUIREMENTS

- A. Section 22 0553 - Identification for Plumbing Piping and Equipment.

1.3 REFERENCE STANDARDS

- A. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; The American Society of Mechanical Engineers; 2011.
- B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2012 (ANSI B16.18).
- C. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2013.
- D. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV; The American Society of Mechanical Engineers; 2011.
- E. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV; The American Society of Mechanical Engineers; 2012.
- F. ASME B31.1 - Power Piping; The American Society of Mechanical Engineers; 2012 (ANSI/ASME B31.1).
- G. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers; 2011 (ANSI/ASME B31.9).
- H. ASME (BPV IV) - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers; The American Society of Mechanical Engineers; 2013.
- I. ASME (BPV IX) - Boiler and Pressure Vessel Code, Section IX - Welding and Brazing Qualifications; The American Society of Mechanical Engineers; 2013.
- J. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999 (Reapproved 2009).

SECTION 221005 - PLUMBING PIPING

- K. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.
- L. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2013a.
- M. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2012.
- N. ASTM B32 - Standard Specification for Solder Metal; 2008.
- O. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes; 2010.
- P. ASTM B68/B68M - Standard Specification for Seamless Copper Tube, Bright Annealed; 2011.
- Q. ASTM B75/B75M - Standard Specification for Seamless Copper Tube; 2011.
- R. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2009.
- S. ASTM B302 - Standard Specification for Threadless Copper Pipe, Standard Sizes; 2012.
- T. ASTM B306 - Standard Specification for Copper Drainage Tube (DWV); 2013.
- U. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2012.
- V. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings; 2004 (Reapproved 2011).
- W. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2012.
- X. ASTM D2661 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings; 2011.
- Y. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2012.
- Z. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2011.
- AA. ASTM D2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings; 2005.

SECTION 221005 - PLUMBING PIPING

- AB. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings; 1996 (Reapproved 2010).
- AC. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2008.
- AD. AWS A5.8/A5.8M - Specification for Filler Metals for Brazing and Braze Welding; American Welding Society; 2011 and errata.
- AE. AWWA C651 - Disinfecting Water Mains; American Water Works Association; 2005 (ANSI/AWWA C651).
- AF. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications; Cast Iron Soil Pipe Institute; 2009.
- AG. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; Cast Iron Soil Pipe Institute; 2011
- AH. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2009.
- AI. MSS SP-70 - Cast Iron Gate Valves, Flanged and Threaded Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2011.
- AJ. MSS SP-71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2011.
- AK. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2013.
- AL. MSS SP-85 - Cast Iron Globe & Angle Valves, Flanged and Threaded Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2011.
- AM. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2010.

1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

SECTION 221005 - PLUMBING PIPING

- C. Project Record Documents: Record actual locations of valves.

1.5 QUALITY ASSURANCE

- A. Perform work in accordance with applicable codes.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.
- C. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- B. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.
- C. Store piping and equipment in clean, enclosed from weather, location at all times. Materials are not to be stored in direct contact with dirty surfaces or on dirt floor. If piping, equipment, and components are found to be improperly stored they shall be removed from the project immediately and new, clean materials shall be used.

1.7 FIELD CONDITIONS

- A. Do not install underground piping when bedding is wet or frozen.

PART 2 - PRODUCTS

2.1 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING

- A. ABS Pipe: ASTM D2661 or ASTM D2751.
 - 1. Fittings: ABS.
 - 2. Joints: Solvent welded with ASTM D2235 cement.
- B. PVC Pipe: ASTM D2665 or ASTM D3034. Schedule 40.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.2 SANITARY SEWER PIPING, ABOVE GRADE

- A. ABS Pipe: ASTM D2661 or ASTM D2751.

SECTION 221005 - PLUMBING PIPING

1. Fittings: ABS.
 2. Joints: Solvent welded with ASTM D2235 cement.
- B. PVC Pipe: ASTM D2665 or ASTM D3034. Schedule 40.
1. Fittings: PVC.
 2. Joints: Solvent welded, with ASTM D2564 solvent cement.
- C. Copper Tube: ASTM B306, DWV.
1. Fittings: ASME B16.29, wrought copper.
 2. Joints: ASTM B32, solder, Grade 50B.

2.3 WATER PIPING, ABOVE GRADE

- A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).
1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
 2. Joints: ASTM B32, solder, Grade 95TA. Mechanical press fit joint with gasket equivalent to PROPRESS acceptable.

2.4 FLANGES, UNIONS, AND COUPLINGS

- A. Unions for Pipe Sizes 3 Inches and Under:
1. Ferrous pipe: Class 150 malleable iron threaded unions.
 2. Copper tube and pipe: Class 150 bronze unions with soldered joints.
- B. Flanges for Pipe Size Over 1 Inch:
1. Ferrous pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
 2. Copper tube and pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.
- C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.
- D. Dielectric Connections: Union thermoplastic-lined steel construction, water impervious isolation barrier, threaded end or Pro-press type compression fittings. IAMPO/UPC Listed.

2.5 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.

SECTION 221005 - PLUMBING PIPING

1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
3. Trapeze Hangers: Welded steel channel frames attached to structure.
4. Vertical Pipe Support: Steel riser clamp.
5. Floor Supports: Concrete pier or steel pedestal with floor flange; fixture attachment.

B. Plumbing Piping - Drain, Waste, and Vent:

1. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
2. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
3. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
4. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
5. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

C. Plumbing Piping - Water:

1. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
2. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
3. Hangers for Hot Pipe Sizes 2 Inches to 4 Inches: Carbon steel, adjustable, clevis.
4. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
5. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
6. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
7. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.
8. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

- D. Combination Spring and Neoprene Isolators: 1-inch static deflection combination spring and neoprene isolators. Similar to Mason Type 30. Use seismically restrained type where hanger is longer than 12-inches and pipe size is 2-inches or over.

2.8 GATE VALVES

A. Manufacturers:

1. Conbraco Industries: www.apollovalves.com.
2. Nibco, Inc: www.nibco.com.
3. Milwaukee Valve Company: www.milwaukeevalve.com.
4. Substitutions: See Section 01 6000 - Product Requirements.

SECTION 221005 - PLUMBING PIPING

B. Up To and Including 3 Inches:

1. MSS SP-80, Class 125, bronze body, bronze trim, rising stem, handwheel, inside screw, solid wedge disc, solder ends.

2.9 BALL VALVES

A. Manufacturers:

1. Conbraco Industries: www.apollovalves.com.
2. Grinnell Mechanical Products, a Tyco International Company: www.grinnell.com.
3. Nibco, Inc: www.nibco.com.
4. Milwaukee Valve Company: www.milwaukeevalve.com.
5. Substitutions: See Section 01 6000 - Product Requirements.

- ### B. Construction, 4 Inches and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze, two piece body, chrome plated brass ball, full port, teflon seats and stuffing box ring, blow-out proof stem, lever handle, solder or threaded ends with union. Solder ends only on smaller than 1 inch.

2.10 SPRING LOADED CHECK VALVES

A. Manufacturers:

1. Hammond Valve: www.hammondvalve.com.
2. Crane Co.: www.cranvalve.com.
3. Milwaukee Valve Company: www.milwaukeevalve.com.
4. Substitutions: See Section 01 6000 - Product Requirements.

- ### B. 2-1/2 inches and over: Class 125, iron body, bronze trim, stainless steel springs, bronze disc, Buna N seals, wafer style ends.

- ### C. Up To and Including 2 inches: Class 125, bronze body. Stainless steel stem and 316 Stainless steel spring with rubber seat, threaded ends. 1" diameter and smaller valves may have soldered ends.

2.11 WATER PRESSURE REDUCING VALVES

A. Manufacturers:

1. Amtrol Inc: www.amtrol.com.
2. Cla-Val Co: www.cla-val.com.
3. Watts Regulator Company: www.wattsregulator.com.
4. Substitutions: See Section 01 6000 - Product Requirements.

- ### B. Up to 2 Inches:

SECTION 221005 - PLUMBING PIPING

1. MSS SP-80, bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded single union ends.
- C. Over 2 Inches:
1. MSS SP-85, cast iron body, bronze fitted, elastomeric diaphragm and seat disc, flanged.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- G. Provide access where valves and fittings are not exposed.
- H. Establish elevations of buried piping outside the building to ensure not less than 4 ft of cover.
- I. Install vent piping penetrating roofed areas to maintain integrity of roof assembly; coordinate with Architectural.

SECTION 221005 - PLUMBING PIPING

- J. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- K. Provide support for utility meters in accordance with requirements of utility companies.
- L. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.
- M. Install bell and spigot pipe with bell end upstream.
- N. Install valves with stems upright or horizontal, not inverted.
- O. Install water piping to ASME B31.9.
- P. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
- Q. Sleeve pipes passing through partitions, walls and floors.
- R. Extend vent through roofs (VTR) minimum 18-inches above roof with fabricated flashing and counter flashing as detailed in Architectural.
- S. Piping Tests: All drainage, sanitary waste and vent piping tested hydrostatically by filling piping to highest point for a minimum of one hour. Leaks developed during tests shall be corrected without caulking in threaded piping or additives and test restarted until a perfectly tight system is obtained. Enclosed piping tested before concealing. Tests performed in presence of ARCHITECT.
- T. Piping Tests: All domestic water piping tested hydrostatically at 125 psi for a minimum of one hour. Equipment, gages, and thermometer wells rated for a lesser pressure suitably protected during tests. Leaks developed during tests shall be corrected without caulking in threaded piping or additives and test restarted until a perfectly tight system is obtained. Enclosed piping tested before concealing. Tests performed in presence of ARCHITECT.
- U. Coordinate piping locations closely with other trades.
- V. Mechanically extracted collars acceptable on pipe sizes 2-inch and over. Installed by contractor with previous documented experience utilizing methods, machines and tools required by manufacturer.
- W. Where piping penetrates wall, run insulation through penetration. Seal penetration with fire stopping insulation and seal with fire stopping sealant. If sleeve is used as required in concrete penetrations, seal opening between pipe and sleeve with fire stopping insulation and seal with fire stopping sealant. Seal as required by manufacturers UL fire rated assembly listing.

SECTION 221005 - PLUMBING PIPING

- X. Where piping penetrates floor, terminate insulation and seal penetrations with fire stopping sealant. If sleeve is used as required in concrete penetrations, seal opening between pipe and sleeve with fire stopping sealant. Seal as required by manufacturers UL fire rated assembly listing.
- Y. Pipe Hangers and Supports:
1. Install in accordance with ASME B31.9.
 2. Support horizontal piping as scheduled.
 3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
 4. Place hangers within 12 inches of each horizontal elbow.
 5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
 7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 8. Provide copper plated hangers and supports for copper piping.
 9. Prime coat exposed steel hangers and supports. Refer to Section 09 9000. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
 10. Support cast iron drainage piping at every joint.
 11. Provide pipe anchors at all elbows and offsets of water service main.
 12. All hangers are to be installed on the outside of the insulated piping.
 13. Seal opening around hanger rods and supports penetrating resilient ceiling in 1st floor ceiling space.

3.4 APPLICATION

- A. Use grooved mechanical couplings and fasteners only in accessible locations.
- B. Install unions downstream of valves and at equipment or apparatus connections.
- C. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- D. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

3.5 TOLERANCES

- A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/4 inch per foot slope.

SECTION 221005 - PLUMBING PIPING

3.6 SCHEDULES

A. Pipe Hanger Spacing:

1. Metal Piping:

- a. Pipe size: 1/2 inches to 1-1/4 inches:
 - 1) Maximum hanger spacing: 6.5 ft.
 - 2) Hanger rod diameter: 3/8 inches.
- b. Pipe size: 1-1/2 inches to 2 inches:
 - 1) Maximum hanger spacing: 10 ft.
 - 2) Hanger rod diameter: 3/8 inch.
- c. Pipe size: 2-1/2 inches to 3 inches:
 - 1) Maximum hanger spacing: 10 ft.
 - 2) Hanger rod diameter: 1/2 inch.

END OF SECTION 22 1005

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Pipe Markers.

1.2 RELATED REQUIREMENTS (NOT USED)

1.3 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers; 2007.
- B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2001 (Reapproved 2007).

1.4 SUBMITTALS

- A. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- B. Product Data: Provide manufacturers catalog literature for each product required.
- C. Manufacturer's Installation Instructions: Indicate special procedures, and installation.
- D. Project Record Documents: Record actual locations of tagged valves.

PART 2 - PRODUCTS

2.1 NAMEPLATES

- A. Manufacturers:
 - 1. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
 - 2. Seton Identification Products: www.seton.com.
- B. Letter Color: White.
- C. Letter Height: 1/4 inch.
- D. Background Color: Black.

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

E. Plastic: Conform to ASTM D709.

2.2 TAGS

A. Manufacturers:

1. Advanced Graphic Engraving: www.advancedgraphicengraving.com.
2. Brady Corporation: www.bradycorp.com.
3. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
4. Seton Identification Products: www.seton.com.

B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

C. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.3 PIPE MARKERS

A. Manufacturers:

1. Brady Corporation: www.bradycorp.com.
2. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
3. MIFAB, Inc.: www.mifab.com.
4. Seton Identification Products: www.seton.com.

B. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

PART 3 - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Symbols, numbers, and all mechanical identification shall match and be in accordance with Contract Documents.

3.2 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

- B. Install tags with corrosion resistant chain.
- C. Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- E. Use tags on piping 3/4 inch diameter and smaller.
 - 1. Identify service, flow direction, and pressure.
 - 2. Install in clear view and align with axis of piping.
 - 3. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.
- f. Identify s, pumps, heat transfer equipment, tanks, backflow preventers, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.
- H. Identify valves in main and branch piping with tags.
- I. Identify piping, concealed or exposed, with plastic pipe markers or plastic tape pipe markers.
 - 1. Plastic pipe markers are to be used on uninsulated piping only.
 - 2. Identify service, flow direction, and pressure.
 - 3. Install in clear view and align with axis of piping.
 - 4. Locate identification not to exceed 15 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.
 - 5. Inaccessible piping need not be identified if piping is identified at nearest accessible or exposed locations.

END OF SECTION 23 0553

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Piping insulation.
- B. Jackets and accessories.

1.2 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 099123 - Interior Painting: Painting insulation jacket.
- C. Section 232113 - Hydronic Piping: Placement of hangers and hanger inserts.

1.3 REFERENCE STANDARDS

- A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2014.
- C. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus; 2013.
- D. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2013).
- E. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2015.
- F. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation; 2015.
- G. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2013).
- H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- I. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.
- J. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.
- K. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum three years of experience.

HVAC PIPING INSULATION - 230719

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.7 FIELD CONDITIONS

- A. Maintain ambient conditions required by manufacturers of each product.
- B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 – PRODUCTS

2.1 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.2 GLASS FIBER

- A. Manufacturers:
 - 1. CertainTeed Corporation; www.certainteed.com.
 - 2. Johns Manville Corporation; www.jm.com.
 - 3. Knauf Insulation; www.knaufinsulation.com.
 - 4. Owens Corning Corporation; Fiberglas Pipe Insulation ASJ: www.ocbuildingspec.com.
 - 5. Substitutions: See Section 016000 - Product Requirements.
- B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
 - 1. 'K' Value: ASTM C177, 0.24 at 75 degrees F.
 - 2. Maximum Service Temperature: 850 degrees F.
 - 3. Maximum Moisture Absorption: 0.2 percent by volume.
- C. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.
- D. Vapor Barrier Lap Adhesive: Compatible with insulation.
- E. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

2.3 JACKETS

- A. PVC Plastic.
 - 1. Manufacturers:
 - a. Johns Manville Corporation; www.jm.com.
 - 2. Jacket: One piece molded type fitting covers and sheet material, off-white color.
 - a. Minimum Service Temperature: 0 degrees F.
 - b. Maximum Service Temperature: 150 degrees F.
 - c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
 - d. Thickness: 10 mil.
 - e. Connections: Brush on welding adhesive.
 - 3. Covering Adhesive Mastic: Compatible with insulation.
 - a. Compatible with insulation.

HVAC PIPING INSULATION - 230719

- B. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.
 - 1. Thickness: 0.016 inch sheet.
 - 2. Finish: Smooth.
 - 3. Joining: Longitudinal slip joints and 2 inch laps.
 - 4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
 - 5. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Insulated pipes conveying fluids below ambient temperature; insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- D. Glass fiber insulated pipes conveying fluids below ambient temperature:
 - 1. Provide vapor barrier jackets, factory-applied or field-applied; secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
 - 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- E. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- F. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.
- G. Glass fiber insulated pipes conveying fluids above ambient temperature.
 - 1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
 - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- H. Inserts and Shields:
 - 1. Application: Piping 1-1/2 inches diameter or larger.
 - 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
- I. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 078400.

HVAC PIPING INSULATION - 230719

- J. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (below 10 feet):
Finish with aluminum jacket.

3.3 SCHEDULE

A. Heating Systems:

1. Heating Water Supply and Return: 1-1/2 inch thick,
2. Glycol Heating Supply and Return: 1-1/2-inch thick.
3. Domestic Cold Water: 1-inch thick.

END OF SECTION 230719

SECTION 230936 - ELECTRONIC CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes electronic thermostats, relays, controllers, wiring, and miscellaneous accessories for electronic control of the boiler pumps and unit heater.
- B. Related Sections:
 - 1. Section 23 2113 – Hydronic Piping: Product requirements for thermometer sockets for placement by this section.
 - 2. Division 26: Execution requirements and Product for electric connections specified by this section.

1.2 REFERENCES

- A. ASME MC85.1 (American Society of Mechanical Engineers) - Terminology for Automatic Control.
- B. NFPA 90A (National Fire Protection Association) - Installation of Air Conditioning and Ventilation Systems.

1.3 SYSTEM DESCRIPTION

- A. Provide electronic control systems consisting of thermostats, controllers, indicating devices, interface equipment and other apparatus and accessories required to operate mechanical systems, and to perform functions specified. Scope of work includes providing controls necessary for the boiler control and unit heater hydronic heating system with room thermostats and controllers.

1.4 SUBMITTALS

- A. See Division 1 for specific requirements regarding: Submittal procedures. Ladder diagrams required with all applicable submittals.
- B. Shop Drawings: Indicate all operating data, system drawings, piping and wiring diagrams, and written detailed operational description of sequences. Provide complete ladder diagram showing sequences, relays, lights, accessories and all safeties specified and shown.
- C. Product Data: Submit Provide description and engineering data for each control system component. Include sizing as requested.
- D. Manufacturer's Installation Instructions: Submit.
- E. Manufacturer's Field Report: Indicate operating conditions after detailed check of systems at Date of Substantial Completion.

1.5 CLOSEOUT SUBMITTALS

- A. See Division 1 for specific requirements regarding: Closeout procedures.

SECTION 230936 - ELECTRONIC CONTROLS

- B. Project Record Documents: Record actual locations of control components, including panels, thermostats, and sensors. Revise shop drawings to reflect actual installation and operating sequences.
- C. Operation and Maintenance Data: Submit systems descriptions, set points, and controls settings and adjustments. Include inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented] experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years documented experience.

1.7 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.8 WARRANTY

- A. See Division 1 for specific requirements regarding: Product warranties and product bonds.

1.9 MAINTENANCE SERVICE

- A. See Division 1 for specific requirements regarding: Requirements for maintenance service.
- B. Provide service and maintenance of control system for one year from Date of Substantial Completion.
- C. Provide complete service of controls systems, including callbacks. Inspect, calibrate, and adjust controls, and submit written reports.

PART 2 - PRODUCTS

2.1 ELECTRONIC CONTROLS

- A. Manufacturers:
 - 1. TEKMAR.
 - 2. Honeywell.
 - 3. Substitutions: See Division 1 for specific requirements.

2.2 CONTROL WIRING

- A. Includes all control wiring to complete the system and provide control arrangements specified or shown on the drawings. Low voltage wiring in exposed areas contained in metallic tubing otherwise protected as required. All low voltage control wiring 18 AWG minimum.

SECTION 230936 - ELECTRONIC CONTROLS

2.3 RELAYS

- A. Description: For Pump controllers and interconnection with unit heater operation.

2.4 THERMOSTATS

- A. Room thermostats with display of setting and room temperature. Line voltage, Suitable for Class II Div I Hazardous location.
- B. Immersion Thermostat: Remote bulb or bimetallic rod and tube type, proportional action with adjustable setpoint and adjustable throttling range. Initially set at 140F in heating return to boiler to shut off Pump P-2 when below setpoint.

2.5 ELECTRICAL CHARACTERISTICS AND COMPONENTS

- A. Division 16: Requirements for electrical characteristics.
- B. Includes all control wiring to complete the system and provide control arrangements specified or shown on the drawings. Power or interlock wiring shall be run in separate conduits from sensor and communications wiring.
 - 1. Low-voltage Control Wiring (12-24v): Protected in exposed locations including, but not limited to, mechanical rooms and storage rooms. Plenum rated cable installed in ceiling plenums above accessible ceilings only. Motor disconnect switch shall also disconnect control circuit. Indicating lights wired from the motor terminals or from the last controlling device to the motor to show actual operation. All low voltage control wiring 18 AWG minimum.
 - 2. 110-volt and larger Control Wiring: 12 AWG minimum if directly operating a motor, and 14 AWG minimum if controlling relays and holding coils.
- C. Control Power: Control Power will be provided under the Electrical Division for new panel locations. The power will be available in J-boxes located in the Mechanical Rooms. Provide the electrical connection between all automatic control equipment and the control power J-boxes.

2.6 SEQUENCE OF OPERATION

- A. Unit Heater:
 - 1. Either room thermostat is to operate Pump P-2 and respective Unit heater blower to maintain setpoint, 60F.
 - 2. Circulation pump P-2 to shut off when outside air is above 60F, through wall mounted thermostat.
- B. Boiler:
 - 1. Boiler Circulation pump P-1 to operate whenever boiler is enabled.
 - 2. Immersion thermostat in heating return to shut off Pump P-2 when below setpoint of 140F.

SECTION 230936 - ELECTRONIC CONTROLS

PART 3 - EXECUTION

3.1 EXAMINATION

- A. See Division 1 for specific requirements regarding: Coordination and project conditions.
- B. Verify that building systems to be controlled are ready to operate.

3.2 FIELD QUALITY CONTROL

- A. After completion of installation, test and adjust control equipment. Submit data showing set points and final adjustments of controls. Check calibration of instruments. Recalibrate or replace. Provide Training.

END OF SECTION 15915

SECTION 23 11 13 - FACILITY FUEL-OIL PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Piping and fittings.
- B. Pipe hangers and supports.
- C. Valves.
- D. Flexible connectors.
- E. Aboveground fuel storage tanks.

1.2 RELATED REQUIREMENTS

- A. Section 230553 - Identification for HVAC Piping and Equipment.
- B. Section 262717 - Equipment Wiring: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

- A. API Std 650 - Welded Steel Tanks for Oil Storage; American Petroleum Institute; 2007 (Errata 2011).
- B. ASME (BPV) - Boiler and Pressure Vessel Code; The American Society of Mechanical Engineers; 2010.
- C. ASME (BPV IX) - Boiler and Pressure Vessel Code, Section IX - Welding and Brazing Qualifications; The American Society of Mechanical Engineers; 2013.
- D. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; The American Society of Mechanical Engineers; 2011.
- E. ASME B31.1 - Power Piping; The American Society of Mechanical Engineers; 2012 (ANSI/ASME B31.1).
- F. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2009.
- G. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2013.
- H. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2010.
- I. NACE SP0286 - Electric Isolation of Cathodically Protected Pipelines; 2007.
- J. NFPA 30 - Flammable and Combustible Liquids Code; National Fire Protection Association; 2012.
- K. NFPA 31 - Standard for the Installation of Oil Burning Equipment; National Fire Protection Association; 2011.
- L. UL 142 - Steel Aboveground Tanks for Flammable and Combustible Liquids; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
- C. Shop Drawings: Provide shop drawing of specific fuel tank provided with all options specific to these tanks included. Indicate tanks, pumps, dimensions, accessories, options, system layout,

SECTION 23 11 13 - FACILITY FUEL-OIL PIPING

pipe sizes, location, tappings, controls and elevations. Manufacturer to provide shop drawings and wiring diagrams for specific project detailing all accessories.

- D. Project Record Documents: Record actual locations of piping system, storage tanks, and system components.
- E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of experience and approved by manufacturer.
- C. Valves: Manufacturer's name and pressure rating marked on valve body.
- D. Perform Work in accordance with NFPA 30 and NFPA 31.

1.6 REGULATORY REQUIREMENTS

- A. Conform to applicable regulations for installation of fuel oil system.
- B. Conform to ASME B31.1 for installation of fuel oil piping.

1.7 START-UP

- A. Provide final quality control inspection and complete start-up of fuel storage system. .

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect piping and fittings from soil and debris with temporary end caps and closures. Maintain in place until installation.

PART 2 – PRODUCTS

2.1 PIPING - ABOVE GROUND

- A. Copper Tube: ASTM B 88 (ASTM B 88M), Type K (A), drawn.
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
 - 2. Joints: AWS A5.8 Classification BCuP-3 or BCuP-4 silver braze.
- B. Steel Pipe: ASTM A 53/A 53M or ASME B36.10M, Schedule 40 black.
 - 1. Fittings: ASME B16.3, malleable iron, or ASTM A 234/A 234M, wrought carbon steel or alloy steel welding type.
 - 2. Joints: NFPA 30, threaded or welded to ASME B31.1.

2.2 PIPE HANGERS AND SUPPORTS

- A. Conform to NFPA 31.
- B. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron, adjustable swivel, split ring.
- C. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

2.4 FLANGES, UNIONS, AND COUPLINGS

- A. Pipe Size 2 Inches and Under:
 - 1. Ferrous pipe: 150 psi malleable iron threaded unions.
 - 2. Copper tube: 150 psi bronze unions with brazed joints.

2.5 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.

SECTION 23 11 13 - FACILITY FUEL-OIL PIPING

1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
 - B. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron, adjustable swivel, split ring.
 - C. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
 - D. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
 - E. Vertical Support: Steel riser clamp.
- 2.6 FUSIBLE VALVES
- A. Manufacturers: Firomatic.
 - B. Nonferrous body, with wheel handle and fusible element to close the valve automatically above 165F. Suitable for manual operation. UL Listed.
- 2.7 BALL VALVES
- A. Manufacturers:
 1. Conbraco Industries: www.apollovalves.com.
 2. Nibco, Inc: www.nibco.com.
 3. Milwaukee Valve Company: www.milwaukeevalve.com.
 4. Substitutions: See Section 016000 - Product Requirements.
 - B. MSS SP-110, Class 150, 400 psi CWP, bronze, two piece body, chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, solder.
- 2.8 SWING CHECK VALVES
- A. Manufacturers:
 1. Hammond Valve: www.hammondvalve.com.
 2. Nibco, Inc: www.nibco.com.
 3. Milwaukee Valve Company: www.milwaukeevalve.com.
 4. Substitutions: See Section 016000 - Product Requirements.
 - B. MSS SP-80, Class 125, bronze body and cap, bronze swing disc, solder ends.
- 2.9 STRAINERS
- A. Manufacturers:
 1. Armstrong International, Inc: www.armstronginternational.com.
 2. Green Country Filter Manufacturing: www.greencountryfilter.com.
 3. WEAMCO: www.weamco.com.
 4. Substitutions: See Section 016000 - Product Requirements.
 - B. Threaded brass body for 175 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.
- 2.10 FLEXIBLE CONNECTORS
- A. Manufacturers:
 1. Circuit Hydraulics, Ltd: www.circuit-hydraulics.co.uk.
 2. Flexicraft Industries: www.flexicraft.com.
 3. Penflex: www.penflex.com.
 4. Substitutions: See Section 016000 - Product Requirements.
 - B. Bronze inner hose and braided exterior sleeve, suitable for minimum 200 psi CWP and 250 degrees F.

SECTION 23 11 13 - FACILITY FUEL-OIL PIPING

2.11 VACUUM GAGES

- A. Manufacturers:
 - 1. Trerice.
 - 2. Weiss.
 - 3. Weksler.
- B. Gage: UL listed with bourdon tube, rotary brass movement, brass socket, front calibration adjustment, black scale on white background.
 - 1. Case: Steel, cast aluminum, or fiberglass reinforced polypropylene.
 - 2. Bourdon Tube: Brass or stainless steel.
 - 3. Dial Size: 4 inch or 4-1/2 inch diameter.
 - 4. Mid-Scale Accuracy: One percent.
 - 5. Scale: Compound 30"-0-30 In. Hg. Vacuum/PSI

2.12 OIL SAFETY VALVE

- A. Manufacturers:
 - 1. Webster Electric OSV
- B. Steel Body for 1256 psi threaded connections. To shut off oil supply with there is no vacuum on the discharge side.

2.13 OIL DE-AERATOR

- A. Manufacturers:
 - 1. Tigerholm; Tigerloop
- B. Description: Nonferrous body. Self-contained reservoir and oil de-aerator with built-in check valve and relief port. For connection of single oil suction fuel supply with supply oil connection, return oil connection and pump connection. 1/2 inch piping connection. Maximum operating temperature of 105F.

2.14 FUEL OIL SYSTEM SPECIALTIES

- A. Vent Cap: Screened air vent for downward venting, T design. Cast-iron construction with screened outlets.
- B. Spill Containment: Locking type with hinged cover. Steel construction with powder white coating inside and out. 7.5 gallon capacity with integral push type drain with a fluoroelastomer o-ring. Connected to 4" IPS tank fitting with nipple.
- C. Drop Tube: Lightweight aluminum with Buna gasket. To fit directly into the tank fill connection and spill containment. Size, 2 inches.
- D. Fill and Gage Stick Cap: Locking type, water tight, threaded connection, brass or cast iron construction. brass, with cast-iron lid.
- E. Emergency Vent: Aluminum body and cast-iron cover. 6-inch size.
- F. Gage: Analog type on tank.
- G. Gage Stick: Wooden rod approximately 10 feet long, with chain and 5-inch diameter ring attached to top end. Rod graduated in volume for tank furnished, indicated in gallons, with graduation not more than 1-1/2 inches on center. Numerals not less than 1/4 inch high.
- H. Tank Decals: Decal kit for No. 1 Fuel Oil storage as required by the Uniform Fire Code. Provide the following decals: 6"x24" DIESEL; 6"x24" COMBUSTIBLE; 6"x24" NO SMOKING. Secure decals to tank on all sides as required by code and approved by the ENGINEER.

SECTION 23 11 13 - FACILITY FUEL-OIL PIPING

2.16 ABOVEGROUND FUEL STORAGE TANKS

- A. Manufacturers:
 - 1. Ace Tank - Greer.
 - 2. Modern Welding.
 - 4. Substitutions: See Section 016000 - Product Requirements.
- B. Double Wall Tank: For installation above ground. Tank listed to conform to UL 142 (Standard for Steel Aboveground Tanks). Dual wall tank, with steel inner tank and steel outer tank. 3/16-inch thick steel (ASTM 36) primary tank and secondary tank. Constructed for seismic compliance. Saddle type integral steel tank supports for mounting on concrete base slab. Tank with required tappings as shown. Secondary containment with 2" monitor port. End Mounted OSHA approved ladder for filling. 18-inch manway.
- C. Capacity: 1,000 gallons.
- D. Mounting: Provide mounting details/shop drawings for tank installation for seismic holddown. Seismic zone 4.
- E. Finish: Sandblast and primed with one coat epoxy primer (3-5 mils) and two topcoats white urethane paint (2-3 mils).
- F. Warranty: 30-year limited warranty against leakage from the secondary containment of the tank, and failure of the primary tank from cracking, breakup, or collapse.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that excavations are to required grade, are dry, and have not been over-excavated.
- B. Verify fuel storage tanks are undamaged. Gouges and scrapes in external coatings of steel tanks repaired immediately with coating material required by manufacturer.

3.2 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.3 GENERAL INSTALLATION

- A. Install in accordance with manufacturers recommendations and installation instructions for complete conformance with warranty requirements. Complete written verification of compliance and submit to tank manufacturer in accordance with warranty requirements. Submit duplicate to OWNER and in O&M manuals.
- B. Install in accordance with Alaska Department of Environmental Conservation and EPA standards and requirements.
- C. Provide instruments with scale ranges selected according to service with largest appropriate scale. Normal measurement point to be mid scale.
- D. Install vacuum gages with 1/4 inch needle valve or ball valve.
- E. Install fusible valves as required and in oil suction line where shown.
- F. Adjust gages to final angle, clean windows and lenses, and calibrate to zero.
- G. Install anti-siphon valve at inlet to burner.

SECTION 23 11 13 - FACILITY FUEL-OIL PIPING

- H. OWNER will provide fuel for the tank. CONTRACTOR to contact OWNER when fuel fill is required. Provide OWNER minimum 48 hours notice.
- I. CONTRACTOR shall deliver to OWNER and provide copy for O&M manuals completed warranty information and certification.

3.4 FUEL OIL PIPING INSTALLATION

- A. Install in accordance with manufacturer's instructions and API RP 1615.
- B. Apply joint compound, similar to Permatex No. 2, to male threads. Teflon tape not allowed.
- C. Test piping under vacuum exceeding 20 inches of mercury or under pressure exceeding 50 psig. Piping shall remain under test for three hours without leakage.
- D. Paint exterior fuel oil piping (2) coats rust preventative primer and (2) coats finish paint immediately after piping installation. All rust shall be removed from piping before priming. Touch up paint after completion.
- E. Backfill fuel oil vent and containment piping with washed pea gravel with minimum bury of 18 inches. Install warning tape 6 inches above all piping and conduit.
- F. Provide non-conducting dielectric connections wherever jointing dissimilar metals. Install to NACE SP0286.
- G. Route piping in orderly manner and maintain gradient.
- H. Group piping whenever practical at common elevations.
- I. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- J. Provide clearance for installation of insulation and access to valves and fittings.
- K. Install permanent metal threaded caps in place of all unused ports on day tank and where day tank manufacturer provided only plastic caps.
- L. Where pipe support members are welded to structural building framing, scrape, brush clean, weld, and apply one coat of zinc rich primer.
- M. Identify piping systems including underground piping. Refer to Section 230553.
- N. Install valves with stems upright or horizontal, not inverted.
- O. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

3.5 FUEL TANK INSTALLATION

- A. Install tank in accordance with EPA and manufacturer requirements for Seismic Zone 4.
- B. Clean and flush tanks prior to filling with fuel oil. Seal until pipe connections are made.
- C. Provide piping connections to tanks with unions.
- D. Install permanent metal threaded caps in place of all unused ports on tank and where tank manufacturer provided only plastic caps.
- E. Secure tank to concrete slab with 5/8-inch minimum angle bolts per tank manufacturer's seismic installation requirements.
- F. Contractor to provide fuel for testing of boilers only. OWNER will provide fuel for complete fill of the tank. CONTRACTOR to contact OWNER when fuel fill is required. Provide OWNER minimum 48 hours notice.

SECTION 23 11 13 - FACILITY FUEL-OIL PIPING

3.6 FUEL TANK SPECIALTIES

- A. Oil tank gage rod stored in Boiler Room.

END OF SECTION 231113

SECTION 23 21 13 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Hydronic system requirements.
- B. Heating water piping, above grade.
- C. Equipment drains and overflows.
- D. Valves:
 - 1. Gate valves.
 - 2. Ball valves.
 - 3. Check valves.

1.2 RELATED REQUIREMENTS

- A. Section 22 0553 - Identification for Plumbing Piping and Equipment.
- B. Section 22 0719 - Plumbing Piping Insulation.
- C. Section 23 0553 - Identification for HVAC Piping and Equipment.
- D. Section 23 0719 - HVAC Piping Insulation.
- E. Section 23 2114 - Hydronic Specialties.

1.3 REFERENCE STANDARDS

- A. ASME (BPV IX) - Boiler and Pressure Vessel Code, Section IX - Welding and Brazing Qualifications; The American Society of Mechanical Engineers; 2013.
- B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2012 (ANSI B16.18).
- C. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; 2013.
- D. ASME B31.5 - Refrigeration Piping and Heat Transfer Components; 2010.
- E. ASME B31.9 - Building Services Piping; 2011 (ANSI/ASME B31.9).
- F. ASTM B32 - Standard Specification for Solder Metal; 2008.
- G. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2009.

SECTION 23 21 13 - HYDRONIC PIPING

- H. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2005 (Reapproved 2011).
- I. ASTM F876 - Standard Specification for Crosslinked Polyethylene (PEX) Tubing; 2013a.
- J. ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications; 2007.
- K. AWS A5.8/A5.8M - Specification for Filler Metals for Brazing and Braze Welding; 2011 and errata.
- L. AWWA C606 - Grooved and Shouldered Joints; 2011 (ANSI/AWWA C606).
- M. MSS SP-58 - Pipe Hangers and Supports - Materials, Design and Manufacture, Selection, Application, and Installation; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2009.

1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data:
 - 1. Include data on pipe materials, pipe fittings, valves, and accessories.
 - 2. Provide manufacturers catalogue information.
 - 3. Indicate valve data and ratings.
- C. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.
- D. Project Record Documents: Record actual locations of valves.
- E. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with minimum three years of experience.

SECTION 23 21 13 - HYDRONIC PIPING

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 - PRODUCTS

2.1 HYDRONIC SYSTEM REQUIREMENTS

- A. Comply with ASME B31.9 and applicable federal, state, and local regulations.
- B. Piping: Provide piping, fittings, hangers and supports as required, as indicated, and as follows:
 - 1. Where more than one piping system material is specified, provide joining fittings that are compatible with piping materials and ensure that the integrity of the system is not jeopardized.
 - 2. Use non-conducting dielectric connections whenever joining dissimilar metals.
 - 3. Grooved mechanical joints may be used in accessible locations only.
 - a. Accessible locations include those exposed on interior of building, in pipe chases, and in mechanical rooms, aboveground outdoors, and as approved by Architect.
 - b. Use rigid joints unless otherwise indicated.
 - 4. Provide pipe hangers and supports in accordance with ASME B31.9 unless indicated otherwise.
- C. Pipe-to-Valve and Pipe-to-Equipment Connections: Use flanges, unions, or grooved couplings to allow disconnection of components for servicing; do not use direct welded, soldered, or threaded connections.
- D. Valves: Provide valves where indicated:
 - 1. Provide drain valves where indicated, and if not indicated provide at least at main shut-off, low points of piping, bases of vertical risers, and at equipment. Use 3/4 inch gate valves with cap; pipe to nearest floor drain.
 - 2. For throttling, bypass, or manual flow control services, use globe or ball valves.
 - 3. For shut-off and to isolate parts of systems or vertical risers, use gate or ball valves.

SECTION 23 21 13 - HYDRONIC PIPING

2.2 HEATING WATER PIPING, ABOVE GRADE

- A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), drawn, using one of the following joint types:
 - 1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings.
 - a. Solder: ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
 - 2. Mechanical press fit joint with gasket equivalent to PROPRESS acceptable.
- B. Polyethylene Pipe: ASTM F876 or ASTM F877, cross-linked polyethylene, 100 psig operating pressure at 180 degrees F. PEX.
 - 1. Fittings: Brass and copper.
 - 2. Joints: Mechanical compression fittings.

2.3 EQUIPMENT DRAINS AND OVERFLOWS

- A. Copper Tube: ASTM B 306, Type DWV, drawn.
 - 1. Fittings: ASME B123, cast bronze, or ASME B 129 wrought copper.
 - 2. Joints: Solder, lead free, ASTM B 32, grade 50B.

2.4 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
 - 1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
 - 2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron, adjustable swivel, split ring.
 - 3. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
 - 4. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 Inches and Over: Steel channels with welded spacers and hanger rods, cast iron roll.
 - 5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
 - 6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
 - 7. Vertical Support: Steel riser clamp.
 - 8. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 - 9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

SECTION 23 21 13 - HYDRONIC PIPING

10. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
11. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.
12. Combination Spring and Neoprene Isolators: 1-inch static deflection combination spring and neoprene isolators. Similar to Mason Type 30. Use seismically restrained type where hanger is longer than 12-inches and pipe size is 2-inches or over.

2.5 UNIONS, FLANGES, MECHANICAL COUPLINGS, AND DIELECTRIC CONNECTIONS

A. Unions for Pipe 2 Inches and Under:

1. Ferrous Piping: 150 psig malleable iron, threaded.
2. Copper Pipe: Bronze, soldered joints.

B. Flanges for Pipe Over 2 Inches:

1. Ferrous Piping: 150 psig forged steel, slip-on.
2. Copper Piping: Bronze.

C. Dielectric Connections: Union or waterway fitting with water impervious isolation barrier and one galvanized or plated steel end and one copper tube end, end types to match pipe joint types used.

D. Dielectric Connections: Union thermoplastic-lined steel construction, water impervious isolation barrier, end types to match pipe joint types used. IAMPO/UPC Listed.

2.6 GATE VALVES

A. Manufacturers:

1. Conbraco Industries: www.apollovalves.com.
2. Milwaukee Valve Company: www.milwaukeevalve.com.
3. Nibco, Inc: www.nibco.com.
4. Tyco Flow Control.
5. Substitutions: See Section 01 6000 - Product Requirements.

B. Up To and Including 2 Inches:

1. Bronze body, bronze trim, hand wheel, inside screw, solid wedge disc, threaded ends. 1 inch and smaller valves may have soldered ends. 15% or less zinc content.

C. Over 2 Inches:

SECTION 23 21 13 - HYDRONIC PIPING

1. Iron body, bronze trim, bolted bonnet, rising stem, handwheel, outside screw and yoke, solid wedge disc with bronze seat rings, flanged ends.

2.7 BALL VALVES

A. Manufacturers:

1. Conbraco Industries: www.apollovalves.com.
2. Milwaukee Valve Company: www.milwaukeevalve.com.
3. Nibco, Inc: www.nibco.com.
4. Tyco Flow Control.
5. Substitutions: See Section 01 6000 - Product Requirements.

B. Up To and Including 3 Inches:

1. Bronze two piece body, chrome plated brass ball, full port, teflon seats and stuffing box ring, blow out proof stem, lever handle threaded ends. 1 inch and smaller may have soldered ends. 15% or less zinc content.

2.8 SWING CHECK VALVES

A. Manufacturers:

1. Hammond Valve: www.hammondvalve.com.
2. Milwaukee Valve Company: www.milwaukeevalve.com.
3. Crane Co.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Class 125, iron body, bronze trim, stainless steel springs, bronze disc, Buna N seals, wafer style ends.

C. Up To and Including 2 inches: Class 125, bronze body. Stainless steel stem and 316 Stainless steel spring with rubber seat, threaded ends. 1" diameter and smaller valves may have soldered ends.

2.09 SPRING LOADED CHECK VALVES

A. Manufacturers:

1. Crane Co.: www.cranvalve.com.
2. Hammond Valve: www.hammondvalve.com.
3. Milwaukee Valve Company: www.milwaukeevalve.com.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Class 125, iron body, bronze trim, stainless steel springs, bronze disc, Buna N seals, wafer style ends.

SECTION 23 21 13 - HYDRONIC PIPING

- C. Up To and Including 2 inches: Class 125, bronze body. Stainless steel stem and 316 Stainless steel spring with rubber seat, threaded ends. 1" diameter and smaller valves may have soldered ends.

2.10 WATER PRESSURE REDUCING VALVES

A. Manufacturers:

1. Amtrol Inc.
2. Cla-Val Co.;
3. Watts Regulator Company.

B. Up to 2 Inches:

1. MSS SP-80, bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded single union ends. Set at 30psi discharge.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Prepare pipe for grooved mechanical joints as required by coupling manufacturer.
- C. Remove scale and dirt on inside and outside before assembly.
- D. Prepare piping connections to equipment using jointing system specified.
- E. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install heating water water piping to ASME B31.9 requirements.
- C. Refer to radiant drawings for piping installation details.
- D. Route piping in orderly manner, parallel to building structure, and maintain gradient.
- E. Install piping to conserve building space and to avoid interfere with use of space.
- F. Group piping whenever practical at common elevations.

SECTION 23 21 13 - HYDRONIC PIPING

- G. Sleeve pipe passing through partitions, walls and floors.
- H. Slope piping and arrange to drain at low points.
- I. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment
- J. Pipe Hangers and Supports:
 - 1. Install in accordance with ASME B31.9.
 - 2. Support horizontal piping as scheduled.
 - 3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
 - 4. Place hangers within 12 inches of each horizontal elbow.
 - 5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 - 6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
 - 7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 - 8. Provide copper plated hangers and supports for copper piping.
 - 9. Prime coat exposed steel hangers and supports. Refer to Section 09 9000. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
 - 10. All hangers are to be installed on the outside of the insulated piping.
 - 11. Seal around hanger rods and supports penetrating resilient ceiling in 1st floor ceiling space.
- K. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- L. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors.
- M. Use eccentric reducers to maintain top of pipe level.
- N. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.
- O. Prepare unfinished pipe, fittings, supports, and accessories, ready for finish painting.
- P. Install valves with stems upright or horizontal, not inverted.
- Q. Branch piping connected to sides of mains. Connections off of top or bottom not permitted. When approved by the Engineer, branch piping may be connected to side of mains at a 45 degree angle when limited by space.

SECTION 23 21 13 - HYDRONIC PIPING

- R. Where piping penetrates wall, run insulation through penetration. Seal penetration with fire stopping insulation and seal with fire stopping sealant. If sleeve is used as required in concrete penetrations, seal opening between pipe and sleeve with fire stopping insulation and seal with fire stopping sealant. Seal as required by manufacturers UL fire rated assembly listing.
- S. Piping Tests: All heating piping tested hydrostatically at 125 psi for minimum of four hours. System shall remain tight for test period without leaks, displacement, or straining. Equipment, gages, and thermometer wells rated for a lesser pressure suitably protected during tests. Leaks developed during tests shall be corrected without caulking and test restarted until a perfectly tight system is obtained. Enclosed piping tested before concealing. Test performed in presence of Owner.
- T. Where more than one piping system material is specified, ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.
- U. Use unions, flanges, and couplings downstream of valves and at equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment or other apparatus. Flanged gasket material shall meet or exceed temperature and pressure rating of system.
- V. Use non-conducting dielectric connections whenever jointing dissimilar metals in open systems.
- W. Use gate or ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

3.3 SCHEDULES

- A. Hanger Spacing for Copper Tubing or Steel Pipe.
 - 1. 1/2 inch and 1-1/4 inch: Maximum span, 6 feet; minimum rod size, 3/8 inch.
 - 2. 1-1/2 inch and 2 inch: Maximum span, 8 feet; minimum rod size, 1/2 inch.
 - 3. 2-1/2 inch through 4 inch: Maximum span, 10 feet; minimum rod size, 1/2 inch.
- B. Hanger Spacing for Plastic Piping.
 - 1. Maximum span, 4 feet; minimum rod size, 1/2 inch.

END OF SECTION 23 2113

SECTION 23 21 14 - HYDRONIC SPECIALTIES

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Expansion tanks.
- B. Air vents.
- C. Air separators.
- D. Strainers.
- E. Pressure-temperature test plugs.
- F. Balancing valves.
- G. Relief valves.

1.2 RELATED REQUIREMENTS

- A. Section 232113 - Hydronic Piping.

1.3 REFERENCE STANDARDS

- A. ASME (BPV VIII, 1) - Boiler and Pressure Vessel Code, Section VIII, Division 1 - Rules for Construction of Pressure Vessels; 2013.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product data for manufactured products and assemblies required for this project. Include component sizes, rough-in requirements, service sizes, and finishes. Include product description, model and dimensions.
- C. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.
- D. Project Record Documents: Record actual locations of flow controls.
- E. Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 – PRODUCTS

2.1 EXPANSION TANKS

- A. Manufacturers:
 - 1. Amtrol Inc: www.amtrol.com. AX-40V ((Design Manufacturer)

SECTION 23 21 14 - HYDRONIC SPECIALTIES

2. ITT Bell & Gossett; www.bellgossett.com.
 3. Taco, Inc; www.taco-hvac.com.
 4. Substitutions: See Section 016000 - Product Requirements.
- B. ET-1: Diaphragm type, heavy duty butyl rubber: Welded steel, tested and stamped in accordance with ASME SEC 8-D; rated for working pressure of 125 psig, with replaceable bladder. Steel stand support.
- D. Accessories: Pressure gage and air-charging fitting.
- E. Size: See Schedules.
- 2.2 AUTOMATIC AIR VENTS
- A. Manufacturers:
1. Spirotherm Spirotop
- B. Brass body, solid non-metallic float, brass vented head threaded for connection of drain. Viton seal and o-ring. 150 psig working pressure. Automatic air vent suitable for system operating temperature and pressure; with isolating valve.
- 2.3 MANUAL AIR VENT
- A. Manufacturers:
1. Hoffman Model 500.
 2. Bell & Gossett Model 17SR.
 3. Taco Model 417.
 4. Substitutions: Not Permitted.
- B. Manual Air Vent; Washer Type: Brass with hydroscopic fiber discs, vent ports, adjustable cap for manual shut-off, and integral spring loaded ball check valve.
- 2.4 AIR SEPARATORS (AS-1)
- A. Manufacturers:
1. Spirotherm - Spirovent Junior VDR series.
- B. Air Separators, Dirt/Water type:
1. Steel construction for 150 psig maximum operating pressure. ASME Section VIII, Division 1. Integrated brass venting mechanism on top. Removable lower head with flanges to clean inside body. Threaded blowdown connection port at bottom.
 2. Threaded connection. 2-inch size.
 3. Air and dirt eliminator: Copper bundle designed to suppress turbulence and provide high efficiency. Shall be capable of removing 100% of free and entrained air, and 99.6% of the dissolved air. Dirt separation shall be at least 80% of all particles 30 micron and larger within 100 passes.
- 2.5 STRAINERS
- A. Manufacturers:
1. Hoffman.
 2. Spiray/Sarco.
 3. Mueller.
 4. Substitutions: See Section 016000 - Product Requirements.
- B. Size 2 inch and Under:
1. Screwed brass or iron body for 175 psi working pressure, Y pattern with 1/32 inch stainless steel perforated screen.

SECTION 23 21 14 - HYDRONIC SPECIALTIES

2.6 FLOW SETTER VALVES

- A. Manufacturers:
 - 1. Armstrong International, Inc.
 - 2. ITT Bell & Gossett.
 - 3. Myson, Inc.
- B. Angle or straight pattern, rising stem, inside screw globe valve for 125 psi working pressure, with bronze body and integral union for screwed connections, renewable composition disc, plastic wheel handle for shut-off service, and lockshield key cap and set screw memory bonnet for balancing service.
- C. Spare: Provide minimum of two spare caps and one set of probes suitable to test the valve.

2.7 RELIEF VALVES

- A. Manufacturers:
 - 1. Armstrong International, Inc: www.armstronginternational.com.
 - 2. ITT Bell & Gossett: www.bellgossett.com.
 - 3. Conbraco Industries: www.apollovalves.com.
 - 4. Watts.
 - 5. Substitutions: See Section 016000 - Product Requirements.
- B. Bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labelled.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install specialties in accordance with manufacturer's instructions.
- B. Where large air quantities can accumulate, provide enlarged air collection standpipes.
- C. Provide manual air vents at system high points and as indicated.
- D. For automatic air vents in ceiling spaces or other concealed locations, provide vent tubing to nearest drain.
- E. Provide air separator on suction side of system circulation pump and connect to expansion tank.
- F. Provide valved drain and hose connection on strainer blow down connection.
- G. Provide spring loaded check valve on discharge side of centrifugal pumps.
- H. Provide relief valves on pressure tanks, low pressure side of reducing valves, heat exchangers, and expansion tanks.
- I. Select system relief valve capacity so that it is greater than make-up pressure reducing valve capacity. Select equipment relief valve capacity to exceed rating of connected equipment.
- J. Pipe relief valve outlet to nearest floor drain.
- K. Where one line vents several relief valves, make cross sectional area equal to sum of individual vent areas.

END OF SECTION 232114

SECTION 23 21 23 - HYDRONIC PUMPS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. In-line circulators.

1.2 RELATED REQUIREMENTS

- A. Section 23 0548 - Vibration and Seismic Controls for HVAC Piping and Equipment.
- B. Section 23 0716 - HVAC Equipment Insulation.
- C. Section 23 0719 - HVAC Piping Insulation.
- D. Section 23 2113 - Hydronic Piping.
- E. Section 23 2114 - Hydronic Specialties.
- F. Section 26 2717 - Equipment Wiring: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

- A. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; National Electrical Manufacturers Association; 2008 (Revised 2010) (ANSI/NEMA OS 1).
- B. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. UL 778 - Standard for Motor-Operated Water Pumps; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements.
- C. Manufacturer's Installation Instructions: Indicate hanging and support requirements and recommendations.
- D. Operation and Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

SECTION 23 21 23 - HYDRONIC PUMPS

- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Provide one set of mechanical seals and coupling for each pump.
 - 3. Provide one spare pump for each of the following: P-1, P-2.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacture, assembly, and field performance of pumps, with minimum three years of documented experience.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. TACO.
- B. ITT Bell & Gossett.
- C. Grundfos.
- D. Substitutions: Not permitted.

2.2 HVAC PUMPS - GENERAL

- A. Provide pumps that operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.
- B. Minimum Quality Standard: UL 778.
- C. Products Requiring Electrical Connection: Listed and classified by UL or testing agency acceptable to authority having jurisdiction as suitable for the purpose specified and indicated.

2.3 IN-LINE CIRCULATORS (P-1, P-2)

- A. Type: Direct connected, replaceable cartridge design, self lubricating, heavy duty construction for 125 psi maximum working pressure. No mechanical seal.
- B. Casing: Stainless steel construction, with flanged pump connections with test ports.
- C. Impeller: Dynamically balanced non-metallic.
- D. Bearings: Permanently-lubricated ceramic ball bearings.

SECTION 23 21 23 - HYDRONIC PUMPS

- E. Shaft: Ceramic. EPDM O-ring and gaskets.
- F. Cartridge: Stainless steel.
- G. Performance: See Schedule.
- H. Electrical Characteristics: Permanent split capacitor motor. 115v, single phase.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Verify that electric power is available and of the correct characteristics.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide access space around pumps for service. Provide no less than minimum space recommended by manufacturer.

3.3 FIELD QUALITY CONTROL

- A. Ensure proper configuration per manufactures requirements.
- B. Motors: Ensure proper alignment and rotation.
- C. Verify power requirements on-site with Control Contractor and Electrical Contractor.

3.4 COORDINATION

- A. Coordinate this Work with the Work of other trades, and make arrangements for the complete and proper accomplishment of all related Work. Coordinate required controls with Control Contractor.

3.5 TESTING AND ADJUSTING

- A. Upon completion of the installation, start-up the system, perform necessary testing and adjust the system to ensure proper operation.

END OF SECTION 23 2123

SECTION 23 51 00 - BREECHINGS, CHIMNEYS, AND STACKS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Manufactured double wall chimneys for fuel fired equipment.

1.2 RELATED REQUIREMENTS

- A. Section 23 5223 – Boilers.

1.3 REFERENCE STANDARDS

- A. ANSI Z21.66 - American National Standard for Automatic Vent Damper Devices for Use with Gas Fired Appliances; 1996 (R2006).
- B. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2009a.
- C. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2003.
- D. ASTM A 1011/A 1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low Alloy, High-Strength Low-Alloy With Improved Formability, and Ultra-High Strength; 2009b.
- E. NFPA 31 - Standard for the Installation of Oil Burning Equipment; National Fire Protection Association; 2006.
- F. NFPA 54 - National Fuel Gas Code; National Fire Protection Association; 2009.
- G. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. NFPA 211 - Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances; National Fire Protection Association; 2011.
- I. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association; 2005.
- J. UL 103 - Factory-Built Chimneys for Residential Type and Building Heating Appliances; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.
- K. UL 378 - Standard for Draft Equipment; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

SECTION 23 51 00 - BREECHINGS, CHIMNEYS, AND STACKS

1.4 DEFINITIONS

- A. Breeching: Vent Connector.
- B. Chimney: Primarily vertical shaft enclosing at least one vent for conducting flue gases outdoors.
- C. Smoke Pipe: Round, single wall vent connector.
- D. Vent: That portion of a venting system designed to convey flue gases directly outdoors from a vent connector or from an appliance when a vent connector is not used.
- E. Vent Connector: That part of a venting system that conducts the flue gases from the flue collar of an appliance to a chimney or vent, and may include a draft control device.

1.5 DESIGN REQUIREMENTS

- A. Factory built vents and chimneys used for venting natural draft appliances shall comply with NFPA 211 and be UL listed and labeled.

1.6 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating factory built chimneys, including dimensional details of components and flue caps, dimensions and weights, electrical characteristics and connection requirements.
- C. Shop Drawings: Indicate general construction, dimensions, weights, support and layout of breechings. Submit layout drawings indicating plan view and elevations where factory built units are used.
- D. Manufacturer's Instructions: Include installation instructions, and indicate assembly, support details, and connection requirements.
- E. Manufacturer's Certificate: Certify that refractory lined metal stacks meet or exceed specified requirements.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing the type of work specified in this section with minimum 3 years of documented experience and approved by manufacturer.

SECTION 23 51 00 - BREECHINGS, CHIMNEYS, AND STACKS

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Schebler Model P2 Series (Design Manufacturer)
- B. AMPCO by Commercial Products Group of Hart & Cooley, Inc.
- C. Selkirk Corporation; www.selkirkcorp.com.

2.2 DOUBLE WALL METAL STACKS

- A. Provide double wall metal stacks, tested to UL 103 and UL listed, for use with building heating equipment, in compliance with NFPA 211. Positive pressure rated. Sections shall be joined and sealed with the use of 'vee-bands' with clips and silicone joint sealant for temperatures up to 600F.
- B. Construct inner jacket of 20 gage ASTM A 666, Type 316 stainless steel. Construct outer jacket of Type 316 stainless steel 20 gage. Provide 1-inch air gap between inner and outer layers.
- C. Accessories, UL labeled:
 - 1. Ventilated Roof Thimble: Consists of roof penetration, vent flashing with spacers and storm collar.
 - 2. Stack Cap: Consists of conical rainshield with inverted cone for partial rain protection with low flow resistance.
 - 3. Cleanout section on bottom of vertical riser.
 - 4. Wall supports.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in accordance with NFPA 54 and 211.
- B. Install breechings with minimum of joints. Align accurately at connections, with internal surfaces smooth.
- C. Support vertical breechings, chimneys, and stacks to adjacent structural surfaces. Refer to SMACNA HVAC Duct Construction Standards - Metal and Flexible for equivalent duct support configuration and size.
- D. Pitch breechings with positive slope up from fuel-fired equipment to chimney or stack.
- E. Provide transition to boiler vent connection, seal air tight with appropriate high temperature sealant.

SECTION 23 51 00 - BREECHINGS, CHIMNEYS, AND STACKS

- F. Seal all joints of positive pressure stacks and breeching in accordance with manufacturer's recommendations, using only sealants recommend by the stack manufacturer.
- G. Provide galvanized sheet metal collar completely covering chimney ceiling penetration.

END OF SECTION 23 51 00

SECTION 23 52 23 - CAST-IRON BOILERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Boilers.
- B. Controls and boiler trim.

1.2 RELATED REQUIREMENTS

- A. Section 232114 - Hydronic Specialties.
- B. Section 235100 - Breechings, Chimneys, and Stacks.
- C. Section 230936 – Electronic Controls..
- D. Section 262717 - Equipment Wiring: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

- A. ASME (BPV IV) - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers; The American Society of Mechanical Engineers; 2007.
- B. ASME (BPV VIII, 1) - Boiler and Pressure Vessel Code, Section VIII, Division 1 - Rules for Construction of Pressure Vessels; The American Society of Mechanical Engineers; 2010.
- C. NFPA 31 - Standard for the Installation of Oil Burning Equipment; National Fire Protection Association; 2011.
- D. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. UL 726 - Oil-Fired Boiler Assemblies; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating general layout, dimensions, and size and location of water, fuel, and vent connections, seismic straps, and electrical characteristics and connection requirements.
- C. Manufacturer's Instructions: Submit manufacturers complete installation instructions.

SECTION 23 52 23 - CAST-IRON BOILERS

- D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, cleaning procedures, replacement parts list, and maintenance and repair data.
- E. Warranty: Submit manufacturer warranty and ensure forms have been completed in OWNER's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.6 REGULATORY REQUIREMENTS

- A. Conform to applicable code for internal wiring of factory wired equipment.
- B. Conform to ASME (BPV IV) and (BPV VIII, 1) for boiler construction.
- C. Units: AGA certified.
- D. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect units before, during, and after installation from damage to casing by leaving factory shipping packaging in place until immediately prior to final acceptance.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Weil-McLain/SPX Corporation; Model 480 (Design Manufacturer)
- B. Burnham
- C. Substitutions: See Section 016000 - Product Requirements.

2.2 MANUFACTURED UNITS

- A. Hot Water Boilers: Suitable for forced draft with insulated jacket, sectional cast iron heat exchanger, fuel oil burning system, refractory, controls, and boiler trim.
- B. Provide water wall design consisting of water backed combustion area with water circulating around firebox. Refractory chamber or separate base not required.
- C. Electrical Characteristics:

SECTION 23 52 23 - CAST-IRON BOILERS

1. Refer to Section 262717.
- D. Efficiency:
 1. Annual Fuel Utilization Efficiency: 0.80.
- E. Schedule: See Sheet M001.

2.3 FABRICATION

- A. Assembly: Cast iron sections with 30 psig water ASME Boilers and Pressure Vessels Code rating, assembled with push nipples or gaskets and draw rods. Factory assembled.
- B. Access: To flue passages for cleaning and flame observation ports.
- C. Structural Base: Aluminized steel lined with high temperature mineral fiber insulating panels.
- D. Jacket: Glass fiber insulated steel jacket, finished with factory applied baked enamel.
- E. Combustion Connection: Top Outlet.
- F. Seismic Restraints: Manufacturer's recommended steel straps welded to sections at factory.

2.4 HOT WATER BOILER TRIM

- A. ASME rated pressure relief valve, 30 psig.
- B. Combination water pressure and temperature gage.
- C. Low water cut-off to prevent burner operation when boiler water falls below safe level.
- D. Operating temperature controller with outdoor reset to maintain boiler water temperature.
 1. Separate Packaged Reset Schedule Provided under Boiler Section: Boilers shall operate to maintain heating supply temperature in heating distribution main according to the following schedule: 190F HS temperature at 20F OSA temperature modulating to 150F HS temperature at 60F OSA temperature.
 2. Controller to operate Pump P-1 whenever boiler is enabled.
- E. High limit thermostat with automatic reset for burner to prevent boiler water temperature from exceeding safe system temperature.
- F. High limit temperature controller with manual reset for burner to prevent boiler water temperature from exceeding safe system temperature.

SECTION 23 52 23 - CAST-IRON BOILERS

- G. Boiler air vent.

2.5 FUEL BURNING SYSTEM

- A. Manufacturer:
 - 1. Beckett CF500-W (Design Manufacturer)
 - 2. Carlin
- B. Burner Operation: On-off with low fire position for ignition. Natural draft operation.
- C. Oil Burner: High pressure atomizing type for No. 2 fuel oil with combustion air blower, fuel pump, hinged flame inspection port, cadmium sulphide flame sensor, electrodes, ignition transformer, and oil nozzle.
- D. Oil Burner Safety Controls: Energize burner motor and electric ignition, limit time for establishment of main flame, monitor flame continuously during burner operation and stop burner on flame failure with manual reset necessary, solenoid oil delay valve opens after burner motor energized and closes when de-energized.
- E. Controls: Pre-wired, factory assembled electronic controls in control cabinet with flame scanner or detector, programming control, relays, and switches. Provide pre-purge and post-purge ignition and shut-down of burner in event of ignition pilot and main flame failure with manual reset.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install boiler in galvanized sheet metal pan blocks approximately 2 inches high.
- C. Provide connection to fuel oil supply in accordance with requirements of NFPA 31.
- D. Provide piping connections and accessories as indicated; refer to Section 232114.
- E. Pipe relief valves to nearest drain.
- F. Provide for connection to electrical service. Refer to Section 262717.
- G. Provide packaged outdoor air reset temperature controller for boiler temperature operation. Coordinate power requirements with electrical division, otherwise provide all low voltage components hereunder.

SECTION 23 52 23 - CAST-IRON BOILERS

3.2 SYSTEM STARTUP

- A. Provide the services of manufacturer's certified field representative for starting and testing unit. Provide standardized testing report of combustion adjustment and analysis.

3.3 CLOSEOUT ACTIVITIES

- A. Train operating personnel in operation and maintenance of units.
- B. Provide the services of the manufacturer's field representative to conduct training.

END OF SECTION 23 5223

SECTION 23 81 01- TERMINAL HEAT TRANSFER UNITS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Unit heaters.

1.2 RELATED REQUIREMENTS

- A. Section 23 2113 - Hydronic Piping.
- B. Section 23 2114 - Hydronic Specialties.
- C. Section 23 00936 – Electronic Controls.
- D. Section 26 2726 – Wiring Devices: Electrical characteristics and wiring connections. Installation of room thermostats. Electrical supply to units.

1.3 SUBMITTALS

- A. See Section 01 2500 – Substitution Procedures, for submittal procedures.
- B. Product Data: Provide typical catalog of information including arrangements.
- C. Manufacturer's Instructions: Indicate installation instructions and recommendations.
- D. Project Record Documents: Record actual locations of components and locations of access doors in radiation cabinets required for access or valving.
- E. Operation and Maintenance Data: Include manufacturers descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.
- F. Warranty: Submit manufacturer's warranty and ensure forms have been completed in OWNER's name and registered with manufacturer.
- G. Maintenance Materials: Furnish the following for OWNER's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

SECTION 23 81 01- TERMINAL HEAT TRANSFER UNITS

- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.5 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 - PRODUCTS

2.1 UNIT HEATERS (UH-1)

- A. Manufacturers: Suitable for Class II Div I Hazardous location.
 - 1. Trane S-240. (Design Manufacturer).
 - 2. Sterling Hydronics/Mestek Technology, Inc
 - 3. Rittling.
 - 4. Vulcan.
- B. Coils: Seamless copper tubing, silver brazed to steel headers, and with evenly spaced aluminum fins mechanically bonded to tubing. Provide coating suitable for humid environment.
- C. Casing: 20 gage thick steel with threaded pipe connections for hanger rods.
- D. Finish: Factory applied baked enamel of color as selected by ARCHITECT.
- E. Fan: Direct drive propeller type, statically and dynamically balanced, with fan guard; horizontal models with permanently lubricated sleeve bearings.
- F. Air Outlet: 4-way Adjustable pattern diffuser with vertical and horizontal discharge..
- G. Motor: Permanently lubricated sleeve bearings on horizontal models.
- H. Control: Local disconnect switch.
- I. Capacity: As scheduled.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install equipment exposed to finished areas after walls and ceiling are finished and painted. Do not damage equipment or finishes.

SECTION 23 81 01- TERMINAL HEAT TRANSFER UNITS

- C. Protection: Provide finished cabinet units with protective covers during balance of construction.
- D. Cabinet and Unit Heaters: Hang from building structure, with pipe hangers anchored to building, not from piping. Mount as high as possible to maintain greatest headroom unless otherwise indicated. Provide channel frame mounting brackets attached to structure for hanging unit heaters as required.

3.2 CLEANING

- A. After construction is completed, including painting, clean exposed surfaces of units. Vacuum clean coils and inside of cabinets.
- B. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.

END OF SECTION 23 8101