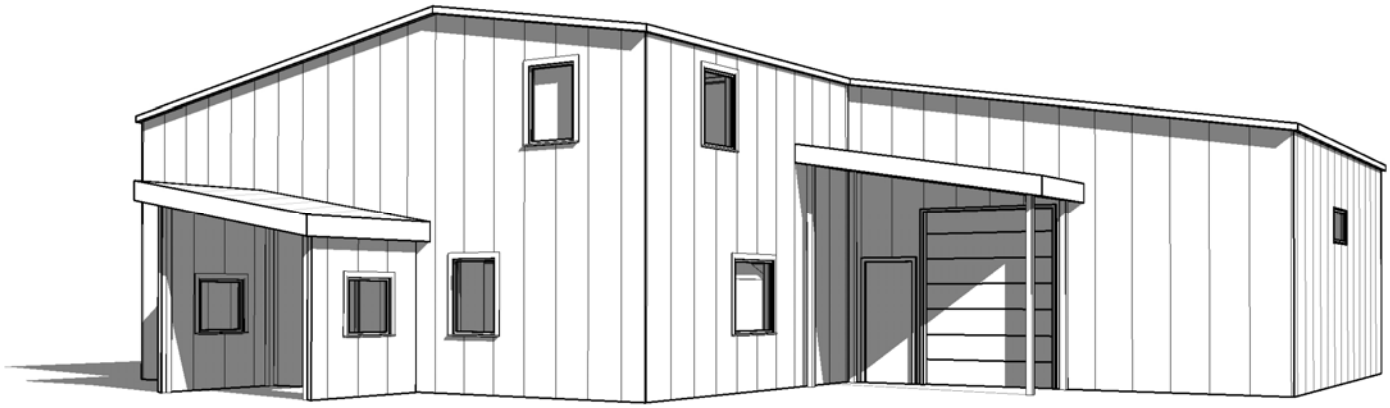
LCG, Inc.
LARSEN CONSULTING GROUP

PYRAMID WATER TREATMENT PLANT LT2 UPGRADE

INVITATION TO BID

DPW Project No. 13401



BIDDING DOCUMENTS FOR CONSTRUCTION

Prepared for:

CITY OF UNALASKA
PUBLIC UTILITIES
P.O. BOX 610
UNALASKA, ALASKA 99685-0610
(907) 581-1260•FAX (907) 581-2187

*3710 Woodland Drive, Suite 2100, Anchorage, Alaska 99517 * Telephone: (907) 243-8985 * Fax (907) 243-5629*

CONTRACT DOCUMENTS AND SPECIFICATIONS
FOR CONSTRUCTION OF

CITY OF UNALASKA
PYRAMID WATER TREATMENT PLANT - LT2 UPGRADE

DPW PROJECT No. 13401

Prepared for:

City of Unalaska
P.O. Box 610
Unalaska, Alaska 99685

BIDDING DOCUMENTS

Prepared by:

Larsen Consulting Group, Inc.
3710 Woodland Dr. Ste 2100
Anchorage, AK 99517

December 6, 2013

City of Unalaska
Pyramid Water Treatment Plant

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Part 1

BIDDING REQUIREMENTS

Section 00030
INVITATION TO BID

Sealed Bids for the City of Unalaska **PYRAMID WATER TREATMENT PLANT - LT2 UPGRADE**, addressed to the City of Unalaska, will be received at the following location:

City of Unalaska
Office of the City Clerk
P.O. Box 610
43 Raven Way
Unalaska, Alaska 99685
Phone: (907) 581-1251
Fax: (907) 581-1417

Sealed bids will be received until 2:00 p.m., local time on **January 16th, 2014** and then will be publicly opened and read. Any bids received after the time and date specified will not be considered. Bidders shall be advised that weather often impacts mail/parcel delivery to Unalaska, bidders should allow sufficient time to ensure that bids will be received by the bid deadline.

The work will include, but not be limited to, furnishing all labor, tools, equipment, and materials and performing all operations in connection with the **PYRAMID WATER TREATMENT PLANT - LT2 UPGRADE**. The work consists of the construction of a new Water Treatment Plant to meet USEPA's Long Term 2 Surface Water Treatment Rule (LT2). This includes a pre-manufactured metal building, associated piping and appurtenances, site work and grading, discharge system and all work necessary for a complete and operable Water Treatment Plant as described in these contract documents.

1. Project Location: City of Unalaska, Pyramid Valley
2. Owner: City of Unalaska, Department of Public Utilities

Interested bidders should email or fax their contact information on official letterhead to Larsen Consulting Group, Inc. at holly@lcgak.com or (907) 243-5629, Attention: Holly Kelty or the City of Unalaska at lgregory@ci.unalaska.ak.us or (907) 581-1260 or by fax at (907) 581-2187. Letter should include company name, contact, phone, fax and email address. It is the responsibility of the bidder to ensure that email or fax was received. Bidder will be added to the official planholders list and contacted to arrange pick-up or delivery of Bidding Documents. Bidding Documents (CD or DVD format) will be available free of charge for pick-up at Larsen Consulting Group in Anchorage or the Unalaska Department of Public Works in Unalaska. If mailed, Bidding Documents will be sent (CD or DVD format) via USPS Express Mail Delivery.

Bid documents also will be filed at the following locations:

Anchorage, Alaska:	The Plans Room LLC	(907) 563-2029
Everett, Washington:	Builders Exchange of Washington	(425) 258-1303
Unalaska, Alaska:	City of Unalaska Website	(907) 581-1260

Technical questions shall be directed in writing to Larsen Consulting Group at the address shown below or by email.

Larsen Consulting Group
Attn: Dale McCoy, PE
3710 Woodland Dr, Suite 2100
Anchorage, Alaska 99517
Phone: (907) 245-8827
Fax: (907) 243-5629
Email: dale@lcgak.com
Cc: rlund@ci.unalaska.ak.us

Each Bid must be submitted on the prescribed form and accompanied by bid security as prescribed in the Instruction to Bidders, payable to the City of Unalaska, Alaska, in an amount not less than 5 (five) percent of the Total Bid amount. The successful bidder will be required to furnish the necessary additional bond(s) for the faithful performance of the Contract, as prescribed in the Bidding Documents.

A pre-bid conference will be held on **December 19th, 2013** at 2:00 p.m. at the City of Unalaska Department of Public Works. Call-in information is as shown.

Phone: 1 (888) 363-4734
Pin: 1258939

The successful Bidder shall hold such Contractors and Business Licenses as required by State Statutes and City of Unalaska Municipal Code Section 90.04. The right is reserved to reject any or all Bids, to waive informalities or irregularities in the bidding, and to accept bids that are considered to be in the best interest of the City of Unalaska.

No bidder may withdraw its bid after the time set for opening thereof, except as outlined in Section 00100, 13 B, unless the award of the contract is delayed for a period exceeding 60 days.

Dated this 5th day of December, 2013.

CITY OF UNALASKA, ALASKA

By Nancy M Peterson
Nancy Peterson, Director of Public Works

Section 00100
INSTRUCTIONS TO BIDDERS

1. **Defined Terms.**

Terms used in these Instructions to Bidders which are defined in the General Conditions of the Contract Documents have the meanings assigned to them in the General Conditions.

Certain additional terms used in the Bidding Documents have the meanings indicated below which are applicable to both the singular and plural thereof.

A. Bidder - one who submits a Bid directly to Owner as distinct from a subbidder, who submits a bid to a Bidder.

B. Bidding Documents - the Bidding Requirements and the proposed Contract Documents (including all Addenda issued prior to receipt of Bids).

C. Bidding Requirements - the Invitation to Bid, Instructions to Bidders, and Bid Form, plus additional documents that may be submitted with the Bid.

D. Issuing Office - the City Public Works Department, from which the Bidding Documents are to be issued and where the bidding procedures are to be administered.

E. Low Bidder - Low Bidder will be determined and if agreed upon by the USEPA on the basis of the lowest Amount for the total bid including Owner chosen Additive and/or Deductive Bid Items as described in the Bid Form. Award of the Additive or Deductive Bid Items will be made to the extent that construction funds are available, in such order as may suit the best interest of the Owner. The Deductive and Additive Bid items are not in any specific order and are not listed in order of preference. The Owner reserves the right to select the low bidder on the basis of the Base Bid plus any combination of Additive and/or Deductive Bid items. If the order of the bids is affected, the award will be made on the basis of the Base Bid plus any combination of the Deductive and Additive Bid items.

F. Successful Bidder - the lowest, qualified, responsible and responsive Bidder to whom the City (on the basis of the City's evaluation as hereinafter provided) makes an Award.

2. **Copies of Bidding Documents.**

A. Complete sets of the Bidding Documents for the sum stated in the Invitation to Bid may be obtained from the Issuing Offices.

B. Complete sets of Bidding Documents must be used in preparing Bids; the City does not assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

C. The Drawings bound in the Contract Documents are at a scale indicated by a note or scale bar on the Drawings.

D. The City, in making copies of Bidding Documents available on the above terms, does so only for the purpose of obtaining Bids for the work and does not confer a license or grant for any other use.

3. **Qualifications of Bidders.**

To demonstrate qualifications to perform the work, each Bidder must be prepared to submit within 5 days after Bid opening upon City's written request, information such as financial data, previous experience, references, present commitments, subcontractor names and qualifications and other such data as may be called for below. Each Bid must contain evidence of Bidder's qualification to do business in Alaska. Bidders shall be eligible to obtain a business license from the City of Unalaska.

Nothing indicated herein should prejudice the right of the Owner to seek additional pertinent information as provided in the General Conditions.

4. **License Requirements**

Contractors and subcontractors, in order to perform public work in the State of Alaska, are required to hold State of Alaska Contractor's licenses of the class required to perform the specified work. Contractors and subcontractors are also required to hold current Alaska Business Licenses and obtain a City of Unalaska businesses license in order to perform public work in the State of Alaska. Contractor's license and Business License numbers shall be inserted in the appropriate place on the Bid form. Evidence of subcontractor's compliance with the above shall be submitted to the City before starting subcontract work on public work contracts.

5. **Examination of Contract Documents and Site.**

A. It is the responsibility of each Bidder before submitting a Bid:

1. To examine thoroughly the Contract Documents and other related data identified in the Bidding Documents (including "technical data" referred to below);

2. To visit the site to become familiar with and satisfy Bidder as to the general, local, and site conditions that may affect cost, progress, performance, or furnishing of the Work;

3. To understand that the information pertaining to subsurface explorations, borings, test holes, and other preliminary investigations appears in the bidding documents. This information was acquired for design purposes only and is not considered adequate for construction. The Owner does not warrant the correctness of the soils investigation or any interpretation, deduction, or conclusion given in the data relative to subsurface conditions. The Bidder shall make his own deductions and conclusions as to the nature

of the materials to be excavated, the difficulties of making and maintaining the required excavations, the difficulties that may arise from the subsurface conditions, and any other work affected by the subsurface conditions, and shall accept full responsibility thereof.

4. To understand that excavation is unclassified and includes all excavation and over-excavation necessary to perform the work, regardless of character or type of materials and obstructions or other hindrances encountered. The Contractor shall perform all excavation of every description and whatever substance encountered, including rock and dewatering or diversion of water

5. To consider federal, state, and local Laws and Regulations that may affect cost, progress, performance, or furnishing of the Work;

6. To study and carefully correlate Bidder's knowledge and observations with the Contract Documents and such other related data;

7. To promptly notify the City of all conflicts, errors, ambiguities or discrepancies which Bidder has discovered in or between the Contract Documents and such other related documents;

8. To review applicability of the City of Unalaska sales tax to any purchases of materials or services related to the Work.

B. Information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the site is based upon information and data furnished to the City by Owners of such Underground Facilities or others, and the City does not assume responsibility for the accuracy or completeness thereof unless it is expressly provided otherwise in the Supplementary Conditions.

C. Provisions concerning responsibility for the adequacy of data furnished to prospective Bidders on subsurface conditions, other physical conditions and Underground Facilities, and possible changes in the Contract Documents due to differing or unanticipated conditions appear in Article 4 of the General Conditions.

D. Before submitting a Bid, each Bidder will be responsible to make or obtain such examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the site or otherwise which may affect cost, progress, performance, or furnishing of the Work or which relate to any aspect of the means, methods, techniques, sequences, or procedures of construction to be employed by Bidder and safety precautions and programs incident thereto or which Bidder deems necessary to determine its Bid for performing and furnishing the Work in accordance with the time, price, and other terms and conditions of the Contract Documents.

E. On request, the City will provide each Bidder access to the site to conduct such examinations, investigations, explorations, tests and studies as each Bidder deems necessary for submission of a Bid. Bidder shall fill all holes and clean up and restore the site to its former condition upon completion of any such explorations, investigations, test, and studies.

F. The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article 5; that, without exception, the Bid is premised upon performing and furnishing the work required by the Contract Documents and applying the specific means, methods, techniques, sequences, or procedures of construction (if any) that may be shown or indicated or expressly required by the Contract Documents; that Bidder has given the Contracting Officer written notice of all conflicts, errors, ambiguities, and discrepancies that Bidder has discovered in the Contract Documents and the written resolution thereof by the City is acceptable to Bidder; and that the Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work.

G. The provisions of paragraph 5A through 5F above, inclusive, do not apply to asbestos, polychlorinated biphenyl (PCB), petroleum, hazardous waste, or radioactive material covered by the Supplementary Conditions.

H. Nothing contained in the Bid Documents, any and all attachments thereto, or any and all addenda thereto, shall be interpreted by any party as requiring or allowing the Contractor to do anything that is not in compliance with all applicable codes and regulations, that is less than general standard industry quality, or that results in an unsafe, unstable or dangerous condition.

6. **Availability of Lands for Work, Etc.**

The lands upon which the work is to be performed, rights-of-way and easements for access thereto, and other lands designated for use by Contractor in performing the work are identified in the Contract Documents. All additional lands and access thereto required for temporary construction facilities, construction equipment, or storage of materials and equipment to be incorporated in the work are to be obtained and paid for by the Successful Bidder. Easements for permanent structures or for permanent changes in existing facilities are to be obtained and paid for by the City unless otherwise provided in the Contract Documents.

7. **Interpretations and Addenda.**

A. All questions about the meaning or intent of the Bidding Documents are to be directed to Larsen Consulting Group. Interpretations or clarifications considered necessary by Larsen Consulting Group in response to such questions will be issued by Addenda mailed or delivered to all parties recorded by the Issuing Office as having received the Bidding Documents. Questions received less than 6 days prior to the date for opening of Bids may not be answered. Only questions answered by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

B. Addenda may also be issued to modify the Bidding Documents as deemed advisable by Larsen Consulting Group.

8. **Bid Security.**

A. Each Bid must be accompanied by Bid security made payable to Owner for 5 percent of Bidder's Total Bid price and in the form of a certified bank check or a Bid Bond on form attached, issued by a Surety meeting the requirements of the General Conditions.

B. The Bid security of a successful bidder will be retained until such Bidder has executed the Agreement, furnished the required Contract security, and met the other conditions of the Notice of Award, whereupon the Bid security will be returned. If the successful Bidder fails to execute and deliver the Agreement and furnish the required Contract security within 15 days after the Notice of Award, Owner may annul the Notice of Award and the Bid security of that Bidder will be forfeited. The bid security of the Bidders whom Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of the 7th day after the Effective Date of the agreement or the 60th day after the Bid opening, whereupon Bid security furnished by such Bidders will be returned. Bid security submitted with bids which are not competitive will be returned within 15 days after the Bid opening.

9. **Contract Times.**

The number of days within which, or the dates by which, the work is to be completed and ready for final payment (the Contract Times as defined in Article 1 of the General Conditions) are set forth in the Agreement (or incorporated therein by reference to the attached Bid Form).

10. **Liquidated Damages.**

Provisions for liquidated damages, if any, are set forth in the Agreement.

11. **Bid Form.**

A. The Bid Form is included with the Bidding Documents.

B. All blanks on the Bid Form must be completed by printing in black ink or by typewriter.

C. Bids by corporations must be executed in the corporate name by the president or a vice-president (or other corporate officer accompanied by evidence of authority to sign) and the corporate seal must be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation must be shown below the signature.

D. Bids by partnerships must be executed in the partnership name and signed by a partner, whose title must appear under the signature and the official address of the partnership must be shown below the signature.

E. All names must be typed or printed in black ink below the signature.

F. The Bid shall contain an acknowledgment of receipt of all Addenda (the numbers of which must be filled in on the Bid Form).

G. The address, telephone, email address, and FAX number for communications regarding the Bid must be shown.

H. See Article 4 above, for required evidence of authority to conduct business as an out-of-state corporation in Alaska. State Contractor license number, if any, must also be shown.

12. **Submission of Bids.**

A. Bids shall be submitted not later than the time prescribed, at the place, and in the manner set forth in the Invitation to Bid and shall be enclosed in an opaque sealed envelope, marked with the project title (and, if applicable, the designated portion of the project for which the Bid is submitted) and name and address of Bidder and accompanied by the other required documents. If the Bid is sent through the mail or other delivery system, the sealed envelope shall be enclosed in a separate envelope with the notation "**BID ENCLOSED**" on the face of it.

Bidders shall be advised that weather often impacts mail/parcel delivery to Unalaska, bidders should allow sufficient time to ensure that bids will be received by the bid deadline.

B. Only one Bid from any individual, firm, partnership, or corporation, under the same or different names, will be considered. Should it appear to the City that any Bidder is interested in more than one Bid for work contemplated, all Bids in which such Bidder is interested will be rejected.

C. Attachments.

Bidder shall complete and submit the following forms with its Bid:

- ✓ Bid Form
- ✓ Addenda Acknowledgment
- ✓ Alaska Bid Bond (5% of Bid)
- ✓ Alaska Business, Unalaska Business and Contractor's Licenses
- ✓ Non-Collusive Affidavit
- ✓ EPA Certification Regarding Debarment, Suspension and Other Responsibility Matters
- ✓ SOA Equal Employment Opportunity Forms

13. **Modifications and Withdrawal of Bids.**

A. Prior to the time and date designated for receipt of Bids, any Bid submitted may be modified or withdrawn by notice to the party receiving Bids at the place designated for receipt of Bids. Such notice shall be in writing over the signature of the Bidder or by facsimile over the signature of the Bidder. The modification shall indicate in writing the amount of the increase or decrease in each bid item being modified and the total amount of the bid modification, however, any modification by facsimile shall be worded as to not reveal the amount of the original or modified Bid. Facsimile contact number is:

Larsen Consulting Group dale@lcgak.com (907) 243-5629 Fax

City of Unalaska rlund@ci.unalaska.ak.us (907) 581-2187 Fax

Bid modifications must be sent to the office to which the original proposal is delivered or sent.

B. If, within 24 hours after Bids are opened, any Bidder files a duly signed, written notice with the City and promptly thereafter demonstrates to the reasonable satisfaction of the City that there was a material and substantial mistake in the preparation of its Bid, that Bidder may withdraw its Bid. Thereafter, that Bidder will be disqualified from further consideration on the Work to be provided under the Contract Documents.

14. **Opening of Bids.**

Bids will be opened and read aloud publicly at the place where Bids are to be submitted.

15. **Bids to Remain Subject to Acceptance.**

All Bids will remain subject to acceptance for 60 days after the day of the Bid opening, but the City may, in its sole discretion, release any Bid and return the Bid security prior to that date.

16. **Award of Contract.**

A. The City reserves the right to reject any or all Bids, including without limitation the rights to reject any or all nonconforming, non responsive, unbalanced or conditional Bids, and to reject the Bid of any Bidder if the City believes that it would not be in the best interest of the Project to make an award to that Bidder, whether because the Bid is not responsive or the Bidder is unqualified or of doubtful financial ability or fails to meet any other pertinent standard or criteria established by Owner. The City also reserves the right to waive all informalities not involving price, time, or changes in the Work and to negotiate Contract terms with the successful Bidder. Discrepancies in the multiplication of units of work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum. Discrepancies between words and figures will be resolved in favor of the words.

B. In evaluating Bids, the City will consider the qualifications of Bidders, whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices, and other data, as may be requested in the Bid Form or prior to the Notice of Award.

C. The City may consider the qualifications and experience of subcontractors, suppliers, and other persons and organizations proposed for those portions of the Work as to which the identity of subcontractors, suppliers, and other persons and organizations must be submitted as provided in the Supplementary Conditions. The City also may consider the operating costs, maintenance requirements, performance data, and guarantees of major items of materials and equipment proposed for incorporation in the Work when such data are required to be submitted prior to the Notice of Award.

D. The City may conduct such investigations as the City deems necessary to assist in the evaluation of any Bid and to establish the responsibility, qualifications, and financial ability of Bidders, proposed subcontractors, suppliers, and other persons and organizations to execute the work in accordance with the Contract Documents to the City's satisfaction within the prescribed time.

E. If, at the time this Contract is to be awarded, the total of the lowest acceptable Bid exceeds the funds then estimated by the City as available, the City may reject all Bids or take such other action as best serves the City's interests.

F. If the Contract is to be awarded, it will be awarded to lowest responsive, responsible Bidder as stated in Section 00100 Instructions To Bidders, whose evaluation by the City indicates to the City that the award will be in the best interests of the Project.

G. In the event of failure of the lowest responsive, responsible Bidder to sign the Contract and provide an acceptable Performance Bond, Payment Bond, and insurance certificate(s), the Owner may award the Contract to the next lowest responsive, responsible Bidder. Such award, if made, will be made within 60 days after the opening of Proposals.

H. An Additive or Deductive Bid Item is an amount proposed by Bidders and stated on the Bid Form for certain construction activities defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if the Owner decides to accept a corresponding change in either the amount of construction to be completed, or in the products, materials, equipment, systems or installation methods described in the Contract Documents.

I. Award of the Additive or Deductive Bid Items will be made to the extent that construction funds are available, in such order as may suit the best interest of the Owner. The Deductive and Additive Bid items are not in any specific order and are not listed in order of preference. The Owner reserves the right to select the Base Bid plus any combination of Additive and/or Deductive Bid items. If the order of the bids is affected, the award will be made on the basis of the Base Bid plus any

combination of Additive or Deductive Bid items that the Owner selects at their option.

17. **Contract Security.**

Article 5 of the General Conditions sets forth Owner's requirements as to Performance and Payment Bonds. When the successful Bidder delivers the executed Agreement to Owner, it must be accompanied by the required Performance and Payment Bonds.

18. **Signing of Agreement.**

When the City gives a Notice of Award to the successful Bidder, it will be accompanied by the required number of unsigned counterparts of the Agreement, with all other written Contract Documents attached. Within 15 days thereafter, contractor shall sign and deliver the required number of counterparts of the Agreement and attached documents to the City with the required Bonds. Within 10 days thereafter, the City shall deliver one fully signed counterpart to Contractor.

19. **Required Wage Rates.**

All workers shall be paid prevailing wage rates. Following is the Federal Wage Determination for the State of Alaska, General Decision Number: AK13001 11/22/2013 AK1 and the State of Alaska Laborers' and Mechanics' Minimum Rates of Pay, Title 36, Public Contracts, AS 36.05 & AS 32.10 Wage and Hour Administration Pamphlet No. 600 – Latest Revision. Contractor is to use whichever rates are higher.

NOTE TO BIDDER: Use BLACK ink or typewriter for completing this Bid Form.

Section 00300
BID FORM

To: **City of Unalaska, Department of Public Works**

Address: **P.O. Box 610, Unalaska, Alaska 99685**

Project Identification: **City of Unalaska PYRAMID WATER TREATMENT PLANT - LT2 UPGRADE**

DEFINITIONS

The terms used in this Bid which are defined in the General Conditions and Instructions to Bidders included as part of the Contract Documents are used with the same meaning in this Bid.

BIDDERS DECLARATION AND UNDERSTANDING

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 the City.

In submitting this Bid, Bidder represents, as more fully set forth in the Agreement, that Bidder has examined copies of all the Bidding Documents.

Bidder has familiarized itself with the nature and extent of the Contract Documents, work, site, locality, general nature of work to be performed by Owner or others at the site that relates to work for which this Bid is submitted as indicated in the Contract Documents, and all local conditions and all federal, state, and local Laws and Regulations that in any manner may affect cost, progress, performance, or furnishing of the work.

Bidder has reviewed and checked all information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the site and assumes responsibility for the accurate location of said Underground Facilities. No additional examinations, investigations, explorations, tests, reports, or similar information or data in respect of said Underground Facilities are or will be required by Bidder in order to perform and furnish the work at the Contract Price, within the Contract Time, and in accordance with the other terms and conditions of the Contract Documents, including specifically the provisions of paragraph 4.3 of the General Conditions.

Bidder has correlated information known to Bidder and the results of all such observations, examinations, investigations, explorations, tests, and studies with the Contract Documents.

Bidder has given the City written notice of all conflicts, errors, ambiguities or discrepancies that it has discovered in the Contract Documents and the written resolution thereof by the City is acceptable to Bidder, and the Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the work for which this Bid is submitted.

CONTRACT EXECUTION AND BONDS

The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an agreement with the City in the form included in the Contract Documents to perform and furnish all work as

specified or indicated in the Contract Documents for the Contract price and within the Contract Time indicated in this Bid and in accordance with the other terms and conditions of the Contract Documents.

Bidder accepts all of the terms and conditions of the Invitation to Bid and Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 60 days after the day of Bid opening. Bidder will sign and deliver the required number of counterparts of the Agreement with the Bonds and City of Unalaska business license and other documents required by the Bidding Requirements within 10 days after the date of Owner's Notice of Award.

CERTIFICATE OF INSURANCE

Bidder agrees to furnish the City, before commencing any Physical Work related to this Contract and as required elsewhere, the certificates of insurance as specified in these Documents.

Bidder further agrees that the amount stated herein includes specific consideration for the insurance coverages, including contractual liability, specified in the Contract Documents.

CONTRACT COMPLETION TIME

Bidder agrees that the work will be completed and ready for final payment in accordance with the number of calendar days or completion date indicated in the Agreement.

LIQUIDATED DAMAGES

Bidder accepts the provisions of the Agreement as to liquidated damages in the event of failure to complete the work within the times specified in the Agreement.

ADDENDA

The Bidder hereby acknowledges that it has received Addenda No's _____, _____, _____, _____, _____, _____ (Bidder shall insert No. of each Addendum received) and agrees that all addenda issued are hereby made part of the Contract Documents, and the Bidder further agrees that its Bid(s) includes all impacts resulting from said addenda.

SALES AND USE TAXES

The Bidder agrees that all sales and use taxes are included in the stated bid prices for the work, unless provision is made herein for the Bidder to separately itemize the estimated amount of sales tax.

SUBCONTRACTORS

The Bidder further agrees that if the bid is the apparent low bid, he shall submit, within 5 days after the bid opening, a listing of subcontracting firms or businesses that will be awarded subcontracts for work in excess of $5,000.

BID TABULATION AND SUMMARY

The Bidder further proposes to accept, as full payment for work proposed herein, the amount computed under provisions of the Contract Documents and based on the following Bid amounts, it being expressly understood that the unit quantities of work shown on the plans is independent of the exact quantities involved. The Bidder agrees that the bid amount represent(s) a true measure of the

labor and materials required to furnish, install, or provide the item of Work, including all allowances for overhead and profit. The amount shall be shown in both words and figures. In case of a discrepancy, the amount shown in words shall govern.

Bidder agrees to perform all of the work described in the Documents including the specifications, special provisions, and as generally shown on the plans for the prices stated in the Bid Schedules. Bidder understands that the Owner reserves the right to reject any or all bids and to waive any informalities in the bidding. Bidder understands that the Owner reserves the right to pick and choose what bid items will be constructed as part of this work, recognizing that Mobilization and Demobilization will be common to the remaining items of Work.

BIDDER

If the Bidder is awarded a construction Contract on this Proposal, the surety who provides the Performance Bond and Payment Bond will be _____ _____ whose address is _____ _____, _____,
Street City
_____.
State Zip

BIDDER

An Individual

By
_____(SEAL)
(Individual's name)

doing business as

_____

Business
address:_____

_____

Phone No.:_____

Fax No.:_____

Email address:_____

A Partnership

By _____ (SEAL)
(Firm name)

_____
(general partner)

Business address: _____

_____

Phone No.: _____

Fax No.: _____

Email address: _____

A Corporation

By _____
(Corporation name)

_____
(state of incorporation)

By _____
(name of person authorized to sign)

_____
(Title)

(Corporate Seal)

Attest _____
(Secretary)

Business address: _____

_____

Phone No.: _____

Fax No.: _____

Email address: _____

A Joint Venture

By_____
(Name)

_____
(Address)

By_____
(Name)

_____
(Address)

Phone Number and Address for receipt of official communications

Business address:_____

_____

Phone No.:_____

Fax No.:_____

Email address:_____

(Each joint venturer must sign. The manner of signing for each individual, partnership, and corporation that is a party to the joint venture should be in the manner indicated above.)

SUBMITTED on _____, 20___.

BID PROPOSAL
City of Unalaska
PYRAMID WATER TREATMENT PLANT - LT2 UPGRADE

ITEM NO.	ESTIMATED QUANTITY	DESCRIPTION (Write Unit Bid Price in Words)
1	Lump Sum	All work necessary for a complete functional Water Treatment Plant as described in these documents except what is described below as an Alternate. _____ _____Per lump sum
Alternate A	Lump Sum	Buried Pipe Portion of the Discharge Water Line. Includes all work associated with installation of the buried 24" diameter ductile iron pipe between Station 0+50 and 1+50 as described on Drawing C1.3, Buried Discharge Water Line Plan and Profile. _____ _____Per lump sum
Alternate B	Lump Sum	Above Ground Pipe Portion of the Discharge Water Line. Includes all work associated with installation of the above ground 24" diameter ductile iron pipe between Station 0+50 and 1+50 as described on Drawing C1.4, Above Ground Discharge Water Line Plan and Profile. _____ _____Per lump sum

Total Bid Price $_____

Total Bid Price (in words):_____

Total Price (Alternate A) $_____ Total Price (Alternate B) $_____

Bidding Company:_____

Name (Printed):_____

Signature:_____ Date:_____

Contractors License No._____ Business License No._____

BID BOND

KNOW ALL MEN BY THESE PRESENTS: that

_____

(Name of Contractor)

_____

(Address of Contractor)

as Principal, hereinafter called Principal, and

_____

(Name of Surety)

_____

(Address of Surety)

a corporation duly organized under the laws of the State of Alaska as Surety, hereinafter called Surety, are held and firmly bound unto

City of Unalaska

(Name of Owner)

PO Box 610, Unalaska, Alaska 99685

(Address of Owner)

as Obligee, hereinafter called Obligee, in the sum of _____ _____Dollars, ($_____) for the payment of which sum well and truly to be made, the said Principal and the said Surety, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted a bid for the City of Unalaska **PYRAMID WATER TREATMENT PLANT - LT2 UPGRADE,** located in Unalaska, Alaska.

NOW THEREFORE, if the Obligee shall accept the bid of the Principal and the Principal shall enter into a Contract with the Obligee in accordance with the terms of such bid, and give such bond or bonds as may be specified in the bidding or Contract Documents with good and sufficient surety for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof, or in the event of the failure of the Principal to enter such Contract and give such bond or bonds, if the Principal shall pay to the Obligee the difference not to exceed the penalty hereof between the amount specified in said bid and such larger amount for which the Obligee may in good faith contract with another party to perform the Work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect.

Signed and Sealed this _____ day of _____ 2014

_____

(Principal) Seal

_____

(Witness)

_____

(Title) Seal

Section 00310

PROJECT SCHEDULE

A. Invitation to Bid issued ..... December 6, 2013
B. Pre-Bid Conference ..... 2:00 pm., Thursday, December 19, 2013
C. Final Questions Due ..... 5:00 pm, Thursday, January 9, 2014
D. Bids Due ..... 2:00 pm., Thursday, January 16, 2014
E. Selection / Intent to Award ..... January 31, 2014
F. Anticipated Award and NTP ..... March 11, 2014
G. Substantial Completion ..... August 1, 2015
H. Final Completion ..... September 30, 2015

Part 2

CONTRACT FORMS

Section 00500

STANDARD FORM OF AGREEMENT
BETWEEN THE OWNER AND CONTRACTOR

THIS AGREEMENT is dated as of the _____ day of _____in the year 2014, by and between the City of Unalaska (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 all work as specified or indicated in the Contract Documents. The work is generally described as follows:

The work will include, but not be limited to, furnishing all labor, tools, equipment, and materials and performing all operations in connection with the **PYRAMID WATER TREATMENT PLANT - LT2 UPGRADE**. The work consists of the construction of a new Water Treatment Plant to meet USEPA's Long Term 2 Surface Water Treatment Rule (LT2). This includes a pre-manufactured metal building, associated piping and appurtenances, site work and grading, construction of a discharge header and all work necessary for a complete and operable Water Treatment Plant as defined in these contract documents.

1. Project Location: City of Unalaska, Pyramid Valley
2. Owner: City of Unalaska, Department of Public Utilities.

The Contract Documents which comprise the entire agreement between OWNER and CONTRACTOR concerning the WORK consists of the following:

- Technical Specifications
- Construction Drawings (Plan Drawings)
- Agreement
- Invitation to Bid
- Instructions to Bidders
- Bid Forms
- Performance Bond
- Payment Bond
- General Conditions
- Supplementary Conditions
- Addenda numbers _____ to _____, inclusive.
- Change Orders which may be delivered or issued after Effective Date of the Agreement and not attached hereto.

Article 2. CONTRACT TIME

2.1 The CONTRACTOR shall have until August 15, 2015 to substantially complete the project. The contractor shall have until September 30, 2015 for final completion.

2.2 Liquidated Damages. The OWNER and 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 times specified above, plus any extensions thereof allowed in accordance with Article 11 of the General Conditions. These types of losses are difficult to quantify. They include, but are not limited to, increased utility and operating costs, regulatory fines, increased expenses associated with management, maintaining utility service, lost efficiency in the movement of City employees and materials, loss of efficiency and impacts to businesses, and general inconvenience to the public. They also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by the OWNER if the work is not completed on time. Accordingly, instead of requiring any such proof, the OWNER and CONTRACTOR agree that as liquidated damages for delay (but not as a penalty) CONTRACTOR shall pay the OWNER for each project shown above, **Five Hundred Dollars ($500.00) for each day** that expires after the time specified above for **Substantial Completion** and **One Thousand Dollars ($1,000.00) for each day** that expires after the time specified above for **Final Completion** and readiness for final payment. Should Substantial Completion not be accomplished before the specified Final Completion date, then the combined liquidated damages shall be **One Thousand Dollars ($1000.00) for each day**.

Article 3. CONTRACT PRICE

3.1 The OWNER shall pay CONTRACTOR for completion of the work in accordance with the Contract Documents an amount equal to the sum of the lump sum prices for each separately identified and selected bid item (herein referred to as the "Contract Sum").

3.2 The Contract sum is based upon the Bid Items which are set forth in the Contract Documents and which are hereby accepted by the OWNER.

Article 4. PAYMENT PROCEDURES

CONTRACTOR shall submit Applications for Payment in accordance with Article 13 of the General Conditions. Applications for Payment will be processed by the OWNER as provided in the General Conditions.

4.1. Progress Payments. The OWNER shall make progress payments on account of the Contract Price on the basis of CONTRACTOR's Applications for Payment on or about a day of the month mutually agreeable to the OWNER and CONTRACTOR as agreed to at the preconstruction conference. All progress payments will be on the basis of the progress of the work measured by the actual installed quantity of items, plus allowances for stockpiled materials.

4.1.1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below, but, in each case, less the aggregate of payments previously made and less such amounts as the OWNER shall determine, or the OWNER may withhold, in accordance with Article 13 (paragraph 13.8) of the General Conditions and the Supplemental Conditions.

a. Ninety percent of work completed.

b. Once 50 percent of the work is complete as determined by the OWNER, and if the character and progress of the work have been satisfactory to the OWNER, the OWNER, may determine that, as long as the character and progress of the work remain satisfactory to them, there will be no additional retainage on account of work completed; in which case, the remaining progress payments prior to Substantial Completion will be in an amount equal to 100 percent of the work completed.

4.1.2. Upon Substantial Completion, in an amount sufficient to increase total payments to CONTRACTOR to 95 percent of the Contract Price, less such amounts as the OWNER shall determine, or the OWNER may withhold, in accordance with Article 13 of the General Conditions.

4.2. Final Payment. Upon final completion and acceptance of the work in accordance with the General Conditions; Affidavit of Payment of Debts and Claims; Affidavit of Release of Liens; and Receipt of Consent of Surety Company to Final Payment, the OWNER shall pay the remainder of the Contract Price as provided in said Article 13.

4.2.1 Deductions. The City may deduct from the amount of any payment made to Contractor any sums owed to City by Contractor including, but not limited to, past due sales tax, port and harbor fees, property tax, or rent. Before making any such deduction the City shall have provided Contractor written notice of the amount claimed by City to be due and owing from Contractor.

Article 5. INTEREST ON RETAINAGE

All retainage shall bear interest at the rate required by AS 36.90.250, if applicable.

Article 6. CONTRACTOR'S REPRESENTATIONS

In order to induce the OWNER to enter into this agreement, CONTRACTOR makes the following representations:

6.1. CONTRACTOR has familiarized itself with the nature and extent of the Contract Documents, work, site, locality, and all local conditions and Laws and Regulations that in any manner may affect cost, progress, performance, or furnishing of the work.

6.2. CONTRACTOR has obtained and carefully studied (or assumes responsibility for obtaining and carefully studying) all such examinations, investigations, explorations, tests, reports, and studies which pertain to the subsurface or physical conditions at or contiguous to the site or which otherwise may affect the cost, progress, performance, or furnishing of the work as CONTRACTOR considers necessary for the performance or furnishing of the work at the Contract Price, within the Contract Time, and in accordance with the other terms and conditions of the Contract Documents, including specifically the provisions of paragraph 4.2 of the General Conditions; and no additional examinations, investigations, explorations, tests, reports, studies, or similar information or data are or will be required by CONTRACTOR for such purposes.

6.3. CONTRACTOR has reviewed and checked all information and data shown or indicated on the Contract Documents with respect to existing Underground Facilities at or contiguous to the site and assumes responsibility for the accurate location of said Underground Facilities. No additional examinations, investigations, explorations, tests, reports, studies, or similar information or data in respect of said Underground Facilities are or will be required by CONTRACTOR in order to perform and furnish the work at the Contract Price, within the Contract Time, and in accordance with the other terms and conditions of the Contract Documents, including specifically the provisions of paragraph 4.4 of the General Conditions.

6.4. CONTRACTOR has correlated the results of all such observations, examinations, investigations, explorations, tests, reports, and studies with the terms and conditions of the Contract Documents.

6.5. CONTRACTOR has given the OWNER written notice of all conflicts, errors, or discrepancies that it has discovered in the Contract Documents and the written resolution thereof by the OWNER is acceptable to CONTRACTOR.

Article 7. MISCELLANEOUS

7.1. DBE Anti-Discrimination Contract 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.

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

7.3. The CONTRACTOR shall submit the Performance Bond, Labor and Material Payment Bonds, and Certification of Insurance and City of Unalaska business licenses and all Subcontractor City of Unalaska business licenses as required by the Contract Documents, prior to commencement of the Work. The Performance and Material Payment Bonds shall be in the amount of 100% of the contract bid price.

7.4. 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.

7.5. OWNER and CONTRACTOR each binds itself, its partners, successors, assigns, and legal representatives to the other party hereto, its partners, successors, assigns, and legal representatives in respect of all covenants, agreements, and obligations contained in the Contract Documents.

IN WITNESS WHEREOF, The OWNER and CONTRACTOR have signed all counterparts of this Agreement. All portions of the Contract Documents have been signed or identified by the OWNER and CONTRACTOR.

This Agreement will be effective on _____, 2014.

CITY OF UNALASKA

By _____
Chris Hladick, City Manager

(CORPORATE SEAL)

Attest _____
City Clerk

Address for giving notices
PO Box 610
Unalaska, Alaska 99685

CONTRACTOR _____

By _____

(CORPORATE SEAL)

Attest _____

Address for giving notices
_____
_____

Section 00610
PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: that

_____
(Name of Contractor)

_____
(Address of Contractor)

as Principal, hereinafter called Principal, and

_____
(Name of Surety)

_____
(Address of Surety)

as Surety, hereinafter called Surety, are held and firmly bound unto

City of Unalaska
(Name of Owner)

PO Box 610, Unalaska, Alaska 99685
(Address of Owner)

as Obligee, hereinafter called Obligee, in the sum of_____

_____Dollars, ($_____) for the payment of which sum well and truly to be made, the said Principal and the said Surety, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Contractor has a written agreement dated _____ day of _____ 20 ____, entered into a Contract with Owner for the

City of Unalaska
PYRAMID WATER TREATMENT PLANT - LT2 UPGRADE

in accordance with the Specifications prepared by Larsen Consulting Group, Inc.**,** which Contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if Contractor shall promptly and faithfully perform said Contract, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

The Surety hereby waives notice of any alteration or extension of time made by the Owner.

Whenever Contractor shall be, and declared by Owner to be in default under the Contract, the Owner having performed Owner's obligations thereunder, the Surety may promptly remedy the default, or shall promptly

1) Complete the Contract in accordance with its terms and conditions, or

2) Obtain a bid or bids for completing the Contract in accordance with its terms and conditions, and upon determination by Surety of the lowest responsible bidder, or, if the Owner elects, upon determination by the Owner and the Surety jointly of the lowest responsible bidder, arrange for a contract between such bidder and Owner, and make available as the Work progresses (even though there should be a default or a succession of defaults under the contract or contracts completion arranged under this paragraph) sufficient funds to pay the cost of completion less the balance of the contract price; but not exceeding, including other costs and damages for which the Surety may be liable hereunder, the amount set forth in the first paragraph hereof. The term "balance of the Contract price", as used in this paragraph, shall mean the total amount payable by Owner to the Contractor under the Contract and any amendments thereto, less the amount properly paid by Owner to Contractor.

Any suit under this bond must be instituted before the expiration of six (6) years from the date on which final payment under the Contract falls due.

No right of action shall accrue on this bond to or for the use of any person or corporation other than the Owner named herein or the heirs, executors, administrators, or successors of the Owner.

Signed and Sealed this _____ day of _____ 2014.

_____
(Principal) Seal

(Witness)

_____ _____
(Title) Seal

_____
(Surety) Seal

_____
(Witness)

_____
(Title) Seal

Section 00620
PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS,

That_____ as Contractor, and _____ as Surety, are held and firmly bound unto City of Unalaska hereinafter called "OWNER", in the sum of _____ dollars, for the payment of which sum, well and truly made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, said CONTRACTOR has been awarded and is about to enter into the annexed Agreement with said OWNER to perform the WORK as specified or indicated in the Contract Documents entitled

City of Unalaska
PYRAMID WATER TREATMENT PLANT - LT2 UPGRADE

NOW THEREFORE, if said CONTRACTOR, or subcontractor, fails to pay for any materials, equipment, or other supplies, or for rental of same, used in connection with the performance of work contracted to be done, or for amounts due under applicable State law for any work or labor thereon, said Surety will pay for the same in an amount not exceeding the sum specified above, and, in the event suit is brought upon this bond, a reasonable attorney's fee to be fixed by the court. This bond shall inure to the benefit of any persons, companies, or corporations entitled to file claims under applicable State law.

PROVIDED, that any alterations in the WORK to be done or the materials to be furnished, or changes in the time of completion, which may be made pursuant to the terms of said Contract Documents, shall not in any way release said CONTRACTOR or said surety thereunder, nor shall any extensions of time granted under the provisions of said Contract Documents release either said CONTRACTOR or said Surety thereunder, nor shall any extensions of time granted under the provisions of said Contract Documents release either said CONTRACTOR or said Surety, and notice of such alterations or extensions of the Agreement is hereby waived by said Surety.

SIGNED AND SEALED, this _____ day of _____ , 2014.

(SEAL)

_____ _____
(CONTRACTOR) (Surety)

By: _____ By: _____
(Signature) (Signature)

(SEAL AND NOTARIAL ACKNOWLEDGMENT OF SURETY

Part 3

GENERAL CONDITIONS

GENERAL CONDITIONS

GENERAL CONDITIONS

ACKNOWLEDGMENT

The City of Unalaska, "General Conditions" are based on the "Standard General Conditions of the Construction Contract" as published by the National Society of Professional Engineers (document number 1910-8, 1983 edition) on behalf of the Engineers Joint Construction Documents Committee. Portions of the NSPE General Conditions are reprinted herein by the express permission of NSPE to the State of Alaska, which supplied these General Conditions to the City of Unalaska. Modifications to the NSPE text are made to provide for State laws, regulations, and established procedures.

The granting of permission by NSPE to allow the State of Alaska to reprint portions of the NSPE document 1910-8, 1983 does not constitute approval of the State of Alaska General Conditions or the subsequently developed City of Unalaska General Conditions.

Insurance requirements were modified March, 2001. Brooks Chandler review comments were incorporated January, 2005 and March, 2008.

ARTICLE 1 - DEFINITIONS

Wherever used in the Contract Documents the following terms, or pronouns in place of them, are used, the intent and meaning, unless a different intent or meaning is clearly indicated, shall be interpreted as set forth below.

The titles and headings of the Sections, Subsections and Articles herein are intended for convenience of reference and shall not be considered as having bearing on their interpretation.

Whenever used in the Specifications or other Contract Documents the following terms have the meaning indicated which are applicable to both the singular and plural thereof. Working titles which have a masculine gender, are intended to refer to persons of either sex.

Terms not defined below shall have their ordinary accepted meanings within the context in which they are used. "Webster's Third New International Dictionary of the English Language, Unabridged, Copyright 1961", or subsequent revision thereof; shall provide ordinarily accepted meanings. Words which have a well-known technical or trade meaning when used to describe work, materials or equipment shall be interpreted in accordance with such meaning. Words defined in Article 1 are capitalized throughout these General Conditions.

Addenda - All clarifications, corrections, or changes issued graphically or in writing by the CITY after the advertisement but prior to the opening of bids.

Advertisement - The public announcement, as required by law, inviting Bids for work to be performed or materials to be furnished.

Application for Payment - The form provided by the CITY which is used by the CONTRACTOR in requesting progress or final payments and which is to include such supporting documentation as is required by the Contract Documents.

Approved or Approval - Means written approval by Contracting Officer or his authorized representative as defined in Article 2.1.

A.S. - Initials which stand for Alaska Statute.

Award - The acceptance, by the City, of the successful Bid.

Bid - The offer of a bidder, on the prescribed form to perform the work at the prices quoted.

Bid Bond - A type of bid Guarantee.

Bid Guaranty - The security furnished with a bid to guarantee that the bidder will enter into a contract if his proposal is accepted by the Department.

Bidder - Any individual, firm, corporation or any acceptable combination thereof, or joint venture submitting a bid for the advertised Work.

Calendar Day - Every day shown on the calendar, beginning and ending at midnight.

Change Order - A written order by the CITY directing changes to the contract, within its general scope.

City - The City of Unalaska, Alaska. References to "owner" or "Contracting Agency" mean the city.

Conditions of the Contract - Those portions of the Contract Documents which define the rights and responsibilities of the contracting parties and of others involved in the Work. The Conditions of the Contract include General Conditions, Supplementary Conditions and other Conditions.

Contract - The written agreement between the CITY and the CONTRACTOR setting forth the obligations of the parties and covering the Work to be performed, all as required by the Contract Documents.

Contract Documents - The Contract Form, Addenda, the Bidding Requirements and CONTRACTOR's Bid (including all appropriate bid tender forms), the Bonds, the Conditions of the Contract and all other Contract Requirements, the Specifications, and the Drawings furnished by the CITY to the CONTRACTOR, together with all change orders and documents approved by the Contracting Officer for inclusion, modifications and supplements issued on or after the Effective Date of the Contract.

Contracting Officer - The person authorized to enter into and administer the contract on behalf of the CITY. He has authority to make findings, determinations and decisions with respect to the contract and, when necessary, to modify or terminate the contract. The Contracting Officer is identified on the Construction Contract.

Contractor - The individual, firm, corporation or any acceptable combination thereof, contracting with the CITY for performance of the Work.

Contract Price - The total moneys payable by the CITY to the CONTRACTOR under the terms of the Contract Documents.

Contract Time - The number of Calendar Days or the date specified in the Construction Contract and authorized time extensions which identify how much time the CONTRACTOR is allowed to achieve Final Completion.

Consultant - A person, firm, agency or corporation retained by the CITY to prepare Contract Documents, perform construction administration services, or other Project related services.

Defective - An adjective which refers to Work that is unsatisfactory, faulty or deficient, or does not conform to the Contract Documents, or does not meet the requirements of any inspection, reference standard, test or approval referred to in the Contract Documents, or has been damaged prior to the CITY's approval of final payment.

Directive - A written communication to the CONTRACTOR from the Contracting Officer interpreting or enforcing a contract requirement or ordering commencement of an item of work.

Drawings - The drawings which show the character and scope of the Work to be performed and which have been furnished by the CITY or the CITY's Consultant and are by reference made a part of the Contract Documents.

Effective Date of the Contract - The date on which the Contract is fully executed by both CONTRACTOR and the CITY.

Final Completion - The Work (or specified part thereof) has progressed to the point that all Work is complete as determined by the Contracting Officer.

General Requirements - Sections of Division 1 of the Specifications which contain administrative and procedural requirements as well as requirements for temporary facilities which apply to Specification Divisions 2 through 16.

Holidays - The City of Unalaska recognizes the following holidays:

1. New Years 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. Veteran's Day - November 11
7. Thanksgiving Day - Fourth Thursday in November
8. 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.

Install - Means to build into the Work, ready to be used in complete and operable condition and in compliance with Contract Documents.

Invitation for Bids or Invitation to Bid - A portion of the Bidding Documents soliciting bids for the Work to be performed.

Notice of Intent to Award - The written notice by the CITY to all Bidders identifying the apparent successful Bidder and establishing the CITY's intent to execute the Contract when all conditions required for execution of the Contract are met.

Notice to Proceed - A written notice to the CONTRACTOR to begin the Work and establishing the date on which the Contract Time begins.

Payment Bond - The security furnished by the CONTRACTOR and his surety to guarantee payment of the debts covered by the bond.

Performance Bond - The security furnished by the CONTRACTOR and his surety to guarantee performance and completion of the work in accordance with the contract.

Project - The total construction, of which the Work performed under the Contract Documents is the whole or a part, where such total construction may be performed by more than one prime contractor.

Project Manager - The authorized representative of the Contracting Officer who is responsible for administration of the Contract.

Proposal - The offer of a bidder, on the prescribed form to perform the work at the prices quoted.

Proposal Guaranty - The security furnished with a proposal to guarantee that the bidder will enter into a contract if his proposal is accepted by the Department.

Regulatory Requirement - Laws, rules, regulations, ordinances, codes and/or orders of the United States, State of Alaska or City of Unalaska to the extent applicable to the Work.

Shop Drawings - All drawings, diagrams, illustrations, schedules and other data which are specifically prepared by or for the CONTRACTOR to illustrate some portion of the Work and all illustrations, brochures, standard schedules, performance charts, instructions, diagrams and other information prepared by a Supplier and submitted by the CONTRACTOR to illustrate material, equipment, fabrication, or erection for some portion of the Work.

Specification - Those portions of the Contract Documents consisting of written technical descriptions of materials, equipment, construction systems, standards and workmanship as applied to the Work and certain administrative and procedural details applicable thereto.

Subcontractor - An individual, firm, or corporation to whom the CONTRACTOR sublets part of the contract.

Substantial Completion - Although not fully completed, the Work (or a specified part thereof) has progressed to the point where, in the opinion of the CITY as evidenced by the CITY's written notice, it is sufficiently complete, in accordance with the Contract Documents, so that the Work (or specified part) can be utilized for the purposes for which it is intended. The terms "Substantially Complete" and "Substantially Completed" as applied to any Work refer to Substantial Completion thereof.

Supplemental Agreement - A written agreement between the CONTRACTOR and the CITY covering work that is not within the general scope of the contract.

Surety - The corporation, partnership, or individual, other than the CONTRACTOR, executing a bond furnished by the CONTRACTOR.

Unit Price Work - Work to be paid for on the basis of unit prices.

Using Agency - The entity who will occupy or use the completed Work.

Work - Work is the act of, and the result of, performing services, furnishing labor, furnishing and incorporating materials and equipment into the Project and performing other duties and obligations, all as required by the Contract Documents. Such Work, however incremental, will culminate in the entire completed Project, or the various separately identifiable parts thereof.

ARTICLE 2 - AUTHORITIES AND LIMITATIONS

2.1 Authorities and Limitations:

2.1.1 The Contracting Officer alone, shall have the power to bind the CITY and to exercise the rights, responsibilities, authorities and functions vested in the Contracting Officer by the Contract Documents, except that the Contracting Officer shall have the right to designate in writing authorized representatives to act for him. Wherever any provision of the Contract Documents specifies an individual or organization, whether Governmental or private, to perform any act on behalf of or in the interests of the CITY that individual or organization shall be deemed to be the Contracting Officer's authorized representative under this Contract but only to the extent so specified. The Contracting Officer may, at any time during the performance of this Contract, vest in any such authorized representatives additional power and authority to act for the Contracting Officer or designate additional representatives, specifying the extent of their authority to act for the Contracting Officer; a copy of each document vesting additional authority in or removing that authority from an authorized representative or designating an additional authorized representative shall be furnished to the CONTRACTOR. The City Council reserves the right to appoint a new Contracting Officer without affecting any of the CONTRACTOR's obligations to the CITY under this Contract.

2.1.2 The CONTRACTOR shall perform the Work in accordance with any written order (including but not limited to instruction, direction, interpretation or determination) issued by an authorized representative in accordance with the authorized representative's authority to act for the Contracting Officer. The CONTRACTOR assumes all the risk and consequences of performing the Work in accordance with any order (including but not limited to instruction, direction, interpretation or determination) of anyone not authorized to issue such order, and of any order not in writing.

2.1.3 Should the Contracting Officer or his authorized representative designate Consultant(s) to act for the CITY as provided for in Paragraph 2.1.1, the performance or nonperformance of the Consultant under such authority to act, shall not give rise to any contractual obligation or duty of the Consultant to the CONTRACTOR, any Subcontractor, any Supplier, or any other organization performing any of the Work or any Surety representing them.

2.1.4 The term "Contracting Officer" when used in the text of these General Conditions or other Contract Documents following this section shall also mean any duly authorized representative of the Contracting Officer when authorized in accordance with Paragraph 2.1.1.

2.2 Evaluations by Contracting Officer:

2.2.1 The Contracting Officer will decide all questions which may arise as to;

a. Quality and acceptability of materials furnished;

b. Quality and acceptability of Work performed;

c. Compliance with the Schedule of Progress;

d. Interpretation of Contract Documents;

e. Acceptable fulfillment of the Contract on the part of the CONTRACTOR.

2.2.2 In order to avoid cumbersome terms and confusing repetition of expressions in the Contract Documents whenever the terms "as ordered", "as directed", "as required", "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 it shall be understood as if the expression were followed by the words "the Contracting Officer". When such terms are used to describe a requirement, direction, review or judgment of the Contracting Officer 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 Contract Documents (unless there is a specific statement indicating otherwise).

2.2.3 The use of any such term or adjective shall not be effective to assign to the CITY 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 provision of paragraphs 2.3 or 2.4.

2.3 Means & Methods:

The means, methods, techniques, sequences or procedures of construction, or safety precautions and the program incident thereto, and the failure to perform or furnish the Work in accordance with the Contract Documents are the sole responsibility of the CONTRACTOR.

2.4 Visits to Site:

The Contracting Officer will make visits to the site and approved remote storage sites at intervals appropriate to the various stages of construction to observe the progress and quality of the executed Work and to determine, in general, if the Work is proceeding in accordance with the Contract Documents. Such observations or the lack of such observations shall in no way relieve the CONTRACTOR from his duty to perform the Work in accordance with the Contract Documents.

ARTICLE 3 - CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.1 Incomplete Contract Documents:

The submission of a Bid by the Bidder is considered a representation that the Bidder examined the Contract Documents to make certain that all sheets and pages were provided and that the Bidder is satisfied as to the conditions to be encountered in performing the Work. The CITY expressly denies any responsibility or liability for a Bid submitted on the basis of an incomplete set of Contract Documents.

3.2 Copies of Contract Documents:

The CITY shall furnish to the CONTRACTOR up to ten copies of the Contract Documents. Additional copies will be furnished, upon request, at the cost of reproduction.

3.3 Scope of Work:

The Contract Documents comprise the entire Contract between the CITY and the CONTRACTOR concerning the Work. The Contract Documents are complementary; what is called for by one is as binding as if called for by all. The Contract Documents will be construed in accordance with the Regulatory Requirements.

It is specifically agreed between the parties executing this Contract that it is not intended by any of the provisions of the Contract to create in the public or any member thereof a third party benefit, or to authorize anyone not a party to this Contract to maintain a suit pursuant to the terms or provisions of the Contract.

3.4 Intent of Contract Documents:

3.4.1 It is the intent of the Contract Documents to describe a functionally complete Project 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 will be supplied, without any adjustment in Contract Price or Contract Time, whether or not specifically called for.

3.4.2 Reference to standard specifications, manuals or codes of any technical society, organization or association, or to the Regulatory Requirements, whether such reference be specific or by implication, shall mean the edition stated in the Contract Documents or if not stated the latest standard specification, manual, code or Regulatory Requirements in effect at the time of Advertisement for the Project (or, in the Effective Date of the Contract if there was no Advertisement). 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 CITY and the CONTRACTOR, or any of their consultants, agents or employees from those set forth in the Contract Documents, nor shall it be effective to assign to the CITY or any of the CITY's 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 2.3 or 2.4.

3.5 Discrepancy in Contract Documents:

3.5.1 Before undertaking the Work, the CONTRACTOR shall carefully study and compare the Contract Documents and check and verify pertinent figures, and dimensions shown thereon and all applicable field measurements. Work in the area by the CONTRACTOR shall imply verification of figures, dimensions and field measurements. If, during the above study or during the performance of the Work, the CONTRACTOR finds a conflict, error, discrepancy or omission in the Contract Document, or a discrepancy between the Contract Documents and any standard specification, manual, code, or Regulatory Requirement which affects the Work, The CONTRACTOR shall promptly report such discrepancy in writing to the Contracting Officer. The CONTRACTOR shall obtain a written interpretation or clarification from the Contracting Officer before proceeding with any Work affected thereby. Any adjustment made by the CONTRACTOR without this determination shall be at his own risk and expense. However, the CONTRACTOR shall not be liable to the CITY for failure to report any conflict, error or discrepancy in the Contract Documents unless the CONTRACTOR had actual knowledge thereof or should reasonably have knowledge thereof.

3.5.2 Discrepancy - Order of Precedence:

When conflicts, errors, or discrepancies within the Contract Documents exist, the order of precedence from most governing to least governing will be as follows:

Supplementary Conditions
General Conditions
General Requirements
Technical Specifications
Drawings (recorded dimensions will govern over scaled dimensions, large details over small scale, schedules over plans, architectural drawings over structural drawings over mechanical and electrical drawings)

3.6 Clarifications and Interpretations:

The Contracting Officer will issue with reasonable promptness such written clarifications or interpretations of the requirements of the Contract Documents as the Contracting Officer may determine necessary, which shall be consistent with or reasonably inferable from the overall intent of the Contract Documents.

3.7 Reuse of Documents:

Neither the CONTRACTOR nor any Subcontractor, or other person or organization performing or furnishing any of the Work under a direct or indirect contract with the CITY shall have or acquire any title to or ownership rights in any of the Contract Documents (or copies thereof) prepared by or for the CITY and they shall not reuse any of the Contract Documents on extensions of the Project or any other project without written consent of the Contracting Officer.

Contract Documents prepared by the CONTRACTOR in connection with the Work shall become the property of the CITY.

ARTICLE 4 - LANDS AND PHYSICAL CONDITIONS

4.1 Availability of Lands:

The CITY 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 use of the CONTRACTOR in connection with the Work. Easements for permanent structures or permanent changes in existing facilities will be obtained and paid for by the CITY, unless otherwise provided in the Contract Documents. 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.

4.2 Visit to Site:

The submission of a Bid by the CONTRACTOR is considered a representation that the CONTRACTOR has visited and carefully examined the site and is satisfied as to the conditions to be encountered in performing the Work and as to the requirements of the Contract Documents.

4.3 Explorations and Reports:

The Supplementary Conditions identify those reports of explorations and tests of subsurface conditions at the site that have been utilized by the CITY in preparation of the Contract Documents. The CONTRACTOR may rely upon the accuracy of the factual data contained in such reports, but not upon interpretations or opinions drawn from such factual data contained therein or for the completeness or sufficiency thereof. Except as indicated in the immediately preceding sentence and in paragraphs 4.4 and 9.9, CONTRACTOR shall have full responsibility with respect to surface and sub-surface conditions at the site.

4.4 Utilities:

4.4.1 The horizontal and vertical locations of known underground utilities as shown or indicated by the Contract Documents are approximate and are based on information and data furnished to the CITY by the owners of such underground utilities.

4.4.2 The CONTRACTOR shall have full responsibility for:

a. Reviewing and checking all information and data concerning utilities.

b. Locating all underground utilities shown or indicated in the Contract Documents which are affected by the Work.

c. Coordination of the Work with the owners of all utilities during construction.

d. Safety and protection of all utilities as provided in paragraph 6.17.

e. Repair of any damage to utilities resulting from the Work in accordance with 4.4.4 and 4.5.

4.4.3 If Work is to be performed by any utility owner, the CONTRACTOR shall cooperate with such owners to facilitate the Work.

4.4.4 In the event of interruption to any utility service as a result of accidental breakage or as a result of being exposed or unsupported, the CONTRACTOR shall promptly notify the utility owner and the Contracting Officer. If service is interrupted repair work shall be continuous until the service is restored. No Work shall be undertaken around fire hydrants until provisions for continued service have been approved by the local fire authority.

4.5 Damaged Utilities:

When utilities are damaged by the CONTRACTOR, the utility owner shall have the choice of repairing the utility or having the CONTRACTOR repair the utility. In the following circumstances, the CONTRACTOR shall reimburse the utility owner for repair costs or provide at no cost to the utility owner or the CITY, all materials, equipment and labor necessary to complete repair of the damage:

a. When the utility is shown or indicated in the Contract Documents.

b. When the utility has been located by the utility owner.

c. When no locate was requested by the CONTRACTOR for utilities shown or indicated in the Contract Documents.

d. All visible utilities.

e. When the CONTRACTOR could have, otherwise, reasonably been expected to be aware of such utility.

4.6 Utilities Not Shown or indicated.

If, while directly performing the Work, an underground utility is uncovered or revealed at the site which was not shown or indicated in the Contract Documents and which the CONTRACTOR could not reasonably have been expected to be aware of, the CONTRACTOR shall, promptly after becoming aware thereof and before performing any Work affected thereby (except in an emergency as permitted by paragraph 6.19) identify the owner of such underground facility and give written notice thereof to that owner and to the Contracting Officer. The Contracting Officer will promptly review the underground utility to determine the extent to which the Contract Documents and the Work should be modified to reflect the impacts of the discovered utility. The Contract Documents will be amended or supplemented to the extent necessary through the issuance of a change document by the Contracting Officer. During such time, the CONTRACTOR shall be responsible for the safety and protection of such underground utility as provided in paragraph 6.17. The CONTRACTOR may be allowed an increase in the Contract Price or an extension of the Contract Time, or both, to the extent that they are directly attributable to the existence of any underground utility that was not shown or indicated in the Contract Documents and which the CONTRACTOR could not reasonably have been expected to be aware of.

4.7 Survey Control:

The CITY will identify sufficient horizontal and vertical control data to enable the CONTRACTOR to survey and layout the Work. All survey work shall be performed under the direct supervision of a registered Land Surveyor when required by paragraph 7.8.

ARTICLE 5 - BONDS, INSURANCE, AND INDEMNIFICATION

5.1 Delivery of Bonds:

When the CONTRACTOR delivers the executed Contract to the Contracting Officer, the CONTRACTOR shall also deliver to the Contracting Officer such bonds as the CONTRACTOR may be required to furnish in accordance with paragraph 5.2.

5.2 Bonds:

The CONTRACTOR shall furnish Performance and Payment Bonds, each in an amount as shown on the Contract as security for the faithful performance and payment of all CONTRACTOR's obligations under the Contract Documents. These bonds shall remain in effect for one year after the date of Final Completion and until all obligations under this Contract, except special guarantees as per 12.7, have been met. All bonds shall be furnished on forms provided by the CITY (or copies thereof) and shall be executed by such Sureties as are authorized to do business in the State of Alaska. The contracting Officer may at his option copy the Surety with notice of any potential default or liability.

5.3 Replacement of Bond and Surety:

If the Surety on any bond furnished in connection with this Contract is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of paragraph 5.2, or otherwise becomes unacceptable to the CITY, or if any such Surety fails to furnish reports as to his financial condition as requested by the CITY, the CONTRACTOR shall within five days thereafter substitute another bond and Surety, both of which must be acceptable to CITY.

5.4 Insurance Requirements:

5.4.1. The contractor shall carry and maintain throughout the life of this contract, at its own expense, insurance not less than the amounts and coverage herein specified, and the City of Unalaska, its employees and agents shall be named as additional insured under the insurance coverage so specified and where allowed, with respect to the performance of the work. There shall be no right of subrogation against the City or its agents performing work in connection with the work, and this **waiver of subrogation** shall be endorsed upon the policies. Insurance shall be placed with companies acceptable to the City of Unalaska; and these policies providing coverage thereunder shall contain provisions that no cancellation or material changes in the policy relative to this project shall become effective except upon **30 days** prior written notice thereof to the City of Unalaska.

5.4.2. Prior to commencement of the work, the contractor shall furnish certificates to the City of Unalaska, in duplicate, evidencing that the Insurance policy provisions required hereunder are in force. Acceptance by the City of Unalaska of deficient evidence does not constitute a waiver of contract requirements.

5.4.3. The contractor shall furnish the City of Unalaska with certified copies of policies upon request. The minimum coverages and limits required are as follows:

1. **Workers' Compensation** insurance in accordance with the statutory coverages required by the State of Alaska **and Employers Liability** insurance with limits not less than **$1,000,000** and, where applicable, insurance in compliance with any other statutory obligations, whether State or Federal, pertaining to the compensation of injured employees assigned to the work, including but not limited to Voluntary Compensation, Federal Longshoremen and Harbor Workers Act, Maritime and the Outer Continental Shelf's Land Act.

2. **Commercial General Liability** with limits not less than **$1,000,000** per Occurrence and **$2,000,000** Aggregate for Bodily Injury and Property Damage, including coverage for Premises and Operations Liability, Products and Completed Operations Liability, Contractual Liability, Broad Form Property Damage Liability and Personal Injury Liability. Coverage shall not contain any exclusion of Explosion, Collapse, or Underground. Coverage is to be endorsed to include a per project aggregate. Additionally, such insurance shall be considered primary to any other insurance carried by the City of Unalaska and the insurer will endorse the policy accordingly.

3. **Commercial Automobile Liability** on all owned, non-owned, hired and rented vehicles with limits of liability of not less than **$1,000,000** Combined Single Limit for Bodily Injury and Property Damage per each accident or loss.

4. If applicable, Contractor's Equipment insurance covering all of the contractor's equipment and machinery to be used in connection with the performance of the work specified in this contract. This coverage requirement may be waived at the discretion of the City of Unalaska if the Contractor self-insures the equipment and will waive all right of recovery against the City of Unalaska in writing.

5. **Umbrella/Excess Liability** insurance coverage of not less than **$1,000,000** per occurrence and annual aggregate providing coverage in excess of General Liability, Auto Liability, and Employers Liability.

6. If work involves use of aircraft, Aircraft Liability insurance covering all owned and non-owned aircraft with a per occurrence limit of not less that $1,000,000.

7. If work involves use of watercraft, Protection and Indemnity insurance with limits not less than $1,000,000 per occurrence. Hull and Machinery coverage is to be carried on the vessel for the full current market value. This coverage requirement may be waived at the discretion of the City of Unalaska if the contractor self-insures the equipment and will waive all rights of recovery against the City of Unalaska in writing.

8. Where applicable, **Professional Liability** insurance with limits of not less than $1,000,000 per claim and $1,000,000 aggregate, subject to a maximum deductible of $10,000 per claim. The City of Unalaska has the right to negotiate increase of deductibles subject to acceptable financial information of the policyholder.

9. Where applicable, Pollution Liability insurance with a project limit of not less than $1,000,000 subject to a maximum deductible of $10,000 to include coverage for Asbestos, Hazardous Materials, Lead or other related environmental hazards. The City of Unalaska has the right to negotiate increase of deductibles subject to acceptable financial information of the policyholder.

   In the event Asbestos, Hazardous Materials, Lead or other related environmental hazards are transported by vehicle and/or marine vessel, the operator of such vehicles and vessels shall provide a Certificate of Insurance for the transportation of such materials (including loading and unloading) with limits of not less than $1,000,000.

10. **Builder's Risk Insurance**: Coverage shall be provided on an "All Risk" completed value basis and protect the interests of the City, the contractor and his subcontractors. Coverage shall include all materials, equipment and supplies that are intended for specific installation in the project while such materials, supplies and equipment are located at the project site and in transit from port of arrival to job site and while temporarily located away from the project site.

5.4.4. Any deductibles or self-insured retentions must be declared to and approved by the City. At the option of the City, either: the insurer shall reduce or eliminate such deductibles or self-insured retentions as respects the City, its officers, officials, employees and volunteers; or the contractor shall provide a financial guarantee satisfactory to the City guaranteeing payment of losses and related investigations, claim administration and defense expense.

5.4.5. All insurance policies as described above are required to be written on an "occurrence" basis. In the event occurrence coverage is not available, the contractor agrees to maintain "claims made" coverage for a minimum of two years after project completion.

5.4.6. If the contractor employs subcontractors to perform any work hereunder, the contractor agrees to require such subcontractors to obtain, carry, maintain, and keep in force during the time in which they are engaged in performing any work hereunder, policies of insurance which comply with the requirements as set forth in this section. This requirement is applicable to subcontractors of any tier.

5.4.7. The contractor is required to maintain all certificates of insurance during the course of the project and for a minimum of three (3) years following the completion of such project. It is further agreed, that upon request by the City of Unalaska, the Contractor will provide copies of any and all subcontractor certificates of insurance for review of compliance.

5.4.8. Failure by the Contractor to maintain the required insurance coverage or to comply with the above, may, at the option of the City of Unalaska, be deemed Defective Work and remedied in accordance with the contract.

5.5 Indemnification:

5.5.1 The CONTRACTOR and his Subcontractors will name the owner as "Additional Insured" and will provide a "Waiver of Subrogation" on all required policies of insurance.

5.5.2 The CONTRACTOR shall indemnify, save harmless, and defend the CITY and its agents and its employees from any and all claims or actions for injuries or damages sustained by any person or property arising directly or indirectly from the CONTRACTOR's performance of this contract; however, this provision has no effect if, but only if, the sole proximate cause of the injury or damage is the negligence of the City or its agents.

ARTICLE 6 - CONTRACTOR'S RESPONSIBILITIES

6.1 Supervision of Work:

The CONTRACTOR shall supervise 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. All Work under this Contract shall be performed in a skillful and workmanlike manner. The CONTRACTOR shall be solely responsible for the means, methods, techniques, sequences and procedures of construction.

6.2 Superintendence by CONTRACTOR:

The CONTRACTOR shall keep on the Work at all times during its progress a competent resident superintendent. The Contracting Officer shall be advised in writing of the superintendent's name, local address, and telephone number. This written advice is to be kept current until Final Acceptance by the CITY. The superintendent will be the CONTRACTOR's representative at the site and shall have full authority to act and sign documents on behalf of the CONTRACTOR.

All communications given to the superintendent shall be as binding as if given to the CONTRACTOR. The CONTRACTOR shall cooperate with the Contracting Officer in every way possible.

6.3 Character of Workers:

The CONTRACTOR shall provide a sufficient number of competent, suitable qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. The CONTRACTOR shall at all times maintain good discipline and order at the site. The Contracting Officer may, in writing, require the CONTRACTOR to remove from the Work any employee the Contracting Officer deems incompetent, careless, or otherwise detrimental to the progress of the Work, but the Contracting Officer shall have no duty to exercise this right.

6.4 CONTRACTOR to Furnish:

Unless otherwise specified in the General Requirements, the CONTRACTOR shall furnish and assume full responsibility for all materials, equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities and all other facilities and incidentals necessary for the furnishing, performance, testing, start-up and completion of the Work.

6.5 Materials and Equipment:

All materials and equipment shall be of specified quality and new, except as otherwise provided in the Contract Documents. If required by the Contracting Officer, 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 provision of any such instructions will be effective to assign to the CITY or any of the CITY's 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 2.3 or 2.4.

6.6 Anticipated Schedules:

6.6.1 Within reasonable time prior to the preconstruction conference the CONTRACTOR shall submit to the Contracting Officer for review an anticipated progress schedule indicating the starting and completion dates of the various stages of the Work.

6.6.2 Within fifteen days after the date of the Notice to Proceed, the CONTRACTOR shall submit to the Contracting Officer for review:

Anticipated schedule of Shop Drawing submissions; and Anticipated Schedule of Values for all of the Work which will include quantities and prices of items aggregating the Contract Price and will subdivide the Work into component parts in sufficient detail to serve as the basis for progress payments during construction. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work which will be confirmed in writing by the CONTRACTOR at the time of submission.

6.7 Finalizing Schedules:

Prior to processing the first Application for Payment the Contracting Officer and the CONTRACTOR will finalize schedules required by paragraph 6.6.

Acceptance by the CITY of the progress schedule, will neither impose on the CITY nor relieve the CONTRACTOR from full responsibility for the progress or scheduling of the Work. If accepted, the finalized schedule of Shop Drawing and other required submissions will be acceptable to the CITY as providing a workable arrangement for processing the submissions. If accepted the finalized Schedule of Values will be acceptable to the CITY as an approximation of anticipated value of Work accomplished over the anticipated Contract Time. Receipt and acceptance of a schedule submitted by the CONTRACTOR shall not be construed to assign responsibility for performance or contingencies to the CITY or relieve the CONTRACTOR of his responsibility to adjust his forces, equipment, and work schedules as may be necessary to insure completion of the Work within prescribed Contract Time. Should the progress of the Work be discontinued for any reason, the CONTRACTOR shall notify the Contracting Officer at least 24 hours in advance of resuming operations.

6.8 Adjusting Schedules:

Upon substantial changes to the schedule or upon request, the CONTRACTOR shall submit to the Contracting Officer for acceptance (to the extent indicated in paragraph 6.7 and the General Requirements) adjustments in the schedules to reflect the actual present and anticipated progress of the Work.

6.9 Substitutes or "Or-Equal" Items:

6.9.1 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. Unless the name is followed by words indicating that no substitution is permitted, materials or equipment of other Suppliers may be accepted by the Contracting Officer only if sufficient information is submitted by the CONTRACTOR which clearly demonstrates to the Contracting Officer that the material or equipment proposed is equivalent or equal in all aspects to that named. The procedure for review by the Contracting Officer will include the following as supplemented in the General Requirements.

6.9.2 Requests for review of substitute items of material and equipment will not be accepted by the Contracting Officer from anyone other than the CONTRACTOR.

6.9.3 If the CONTRACTOR wishes to furnish or use a substitute item of material or equipment, the CONTRACTOR shall make written application to the Contracting Officer for acceptance thereof, certifying 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. The application will state that the evaluation and acceptance of the proposed substitute will not delay the CONTRACTOR's achievement of Substantial Completion on time, whether or not acceptance of the substitute for use in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with the CITY for work on the Project) to adapt the design to the proposed substitute and whether or not incorporation or use of the substitute in connection with the Work is subject to payment of any license fee or royalty.

6.9.4 All variations of the proposed substitute from that specified will be identified in the application and available maintenance, repair and replacement service will be indicated. The application will also contain an itemized estimate of all costs that will result directly or indirectly from acceptance of such substitute, including costs of redesign and claims of other contractors affected by the resulting change, all of which shall be considered by the Contracting Officer in evaluating the proposed substitute. The Contracting Officer may require the CONTRACTOR to furnish at the CONTRACTOR's expense additional data about the proposed substitute. The Contracting Officer may reject any substitution request which the Contracting Officer determines is not in the best interest of the CITY.

6.10 Substitute Means and Methods:

If a specific means, method, technique, sequence or procedure of construction is indicated in or required by the Contract Documents, the CONTRACTOR may furnish or utilize a substitute means, method, sequence, technique or procedure of construction acceptable to the Contracting Officer, if the CONTRACTOR submits sufficient information to allow the Contracting Officer to determine that the substitute proposed is equivalent to that indicated or required by the Contract Documents. The procedure for review by the Contracting Officer will be similar to that provided in paragraph 6.9 as applied by the Contracting Officer and as may be supplemented in the General Requirements.

6.11 Evaluation of Substitution:

The Contracting Officer will be allowed a reasonable time within which to evaluate each proposed substitute. The Contracting Officer will be the sole judge of acceptability, and no substitute will be ordered, installed or utilized without the Contracting Officer's prior written acceptance which will be evidenced by either a Change Order or a Shop Drawing approved in accordance with Sections 6.20 and 6.21. The Contracting Officer may require the CONTRACTOR to furnish at the CONTRACTOR's expense a special performance guarantee or other surety with respect to any substitute.

6.12 Dividing the Work:

The divisions and sections of the Specifications and the identifications of any Drawings shall not control the CONTRACTOR in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

6.13 Subcontractors:

The CONTRACTOR may utilize the services of licensed specialty Subcontractors on those parts of the Work which, under normal contracting practices, are performed by licensed specialty Subcontractors, in accordance with the following conditions:

6.13.1 The CONTRACTOR shall not award any Work to any Subcontractor without prior written approval of the Contracting Officer. This approval will not be given until the CONTRACTOR submits to the Contracting Officer a written statement concerning the proposed award to the Subcontractor which shall contain required E.E.O. documents, evidence of insurance, and a copy of the proposed subcontract executed by the subcontractor. No acceptance by the Contracting Officer of any such Subcontractor shall constitute a waiver of any right of the CITY to reject Defective Work.

6.13.2 The CONTRACTOR shall be fully responsible to the CITY for all acts and omissions of the Subcontractors, Suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect contract with CONTRACTOR just as CONTRACTOR is responsible for CONTRACTOR's own acts and omissions.

6.13.3 All Work performed for CONTRACTOR by a Subcontractor will be pursuant to an appropriate written agreement between CONTRACTOR and the Subcontractor which specifically binds the Subcontractor to the applicable terms and conditions of the Contract Documents for the benefit of the CITY and contains waiver provisions as required by paragraph 13.17 and termination provisions as required by Article 14.

6.13.4 Nothing in the Contract Documents shall create any contractual relationship between the CITY and any such Subcontractor, Supplier or other person or organization, nor shall it create any obligation on the part of the CITY to pay or to see to the payment of any moneys due any such Subcontractor, Supplier or other person or organization except as may otherwise be required by Regulatory Requirements. The CITY will not undertake to settle any differences between or among the CONTRACTOR, Subcontractors, or Suppliers.

6.13.5 The CONTRACTOR and Subcontractors shall coordinate their work and facilitate general progress of Work. Each trade shall afford other trades every reasonable opportunity for installation of their work and storage of materials. If cooperative work of one trade must be altered due to lack of proper supervision, or failure to make proper provisions in time by another trade, such conditions shall be remedied by the CONTRACTOR with no change in Contract Price or Contract Time.

6.13.6 The CONTRACTOR shall include on his own payrolls any person or persons working on the contract who are not covered by written subcontract, and shall ensure that all Subcontractors include on their payrolls all persons performing work under the direction of the Subcontractor.

6.14 Use of Premises:

The CONTRACTOR shall confine construction equipment, the storage of materials and equipment and the operations of workers to the Project limits and approved remote storage sites and lands and areas identified in and permitted by Regulatory Requirements, rights-of-way, permits and easements, and shall not unreasonably encumber the premises with construction equipment or other materials or equipment. 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 CITY by any such owner or occupant because of the performance of the Work, the CONTRACTOR shall hold the CITY and its agencies harmless.

6.15 Structural Loading:

The CONTRACTOR shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall the CONTRACTOR subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.16 Record Documents:

The CONTRACTOR shall maintain in a safe place at the site one record copy of all Drawings, Specifications, Addenda, Field Memos, Work Orders, Change Orders, Supplemental Agreements, and written interpretations and clarifications (issued pursuant to paragraph 3.6) in good order and annotated to show all changes made during construction. These record documents together with all approved samples and a counterpart of all approved Shop Drawings will be available to the Contracting Officer for reference and copying. Upon completion of the Work, the annotated record documents, samples and Shop Drawings will be delivered to the Contracting Officer. Record documents shall accurately record variations in the Work which vary from requirements shown or indicated in the Contract Documents.

6.17 Safety and Protection:

The CONTRACTOR alone 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:

6.17.1 All employees on the Work and other persons and organizations who may be affected thereby;

6.17.2 All the Work and materials and equipment to be incorporated therein, whether in storage on or off the site; and

6.17.3 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.

6.17.4 The CONTRACTOR shall comply with all applicable Regulatory Requirements enacted 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 utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation and replacement of their property. All damage, injury or loss to any property caused, directly or indirectly, in whole or in part, by the Contractor, any Subcontractor, Supplier or any other person or organization directly or indirectly employed by any of them to perform or furnish any of the Work or anyone for whose acts any of them may be liable, shall be remedied by the CONTRACTOR with no change in Contract Price or Contract Time except as stated in 4.6, except damage or loss attributable to unforeseeable causes beyond the control of and without the fault or negligence of the CONTRACTOR, including but not restricted to acts of God or the public enemy. The CONTRACTOR's duties and responsibilities for the safety and protection of the Work shall continue until Final Acceptance (except as otherwise expressly provided in connection with Substantial Completion).

6.18 Safety Representative:

The CONTRACTOR shall designate a responsible safety representative at the site. This person shall be the CONTRACTOR's superintendent unless otherwise designated in writing by the CONTRACTOR to the Contracting Officer.

6.19 Emergencies:

In emergencies affecting the safety or protection of persons or the Work or property at the site or adjacent thereto, the CONTRACTOR, without special instruction or authorization from the CITY, is obligated to act to prevent threatened damage, injury or loss. The CONTRACTOR shall give the Contracting Officer prompt written notice if the CONTRACTOR believes that any significant changes in the Work or variations from the Contract Documents is required because of the action taken in response to an emergency, a change will be authorized by one of the methods indicated in Paragraph 9.2, as determined appropriate by the Contracting Officer.

6.20 Shop Drawings and Samples:

6.20.1 After checking and verifying all field measurements and after complying with applicable procedures specified in the General Requirements, the CONTRACTOR shall submit to the Contracting Officer for review and approval in accordance with the accepted schedule of Shop Drawing submissions the required number of all Shop Drawings, which will bear a stamp or specific written indication that the CONTRACTOR has satisfied CONTRACTOR's responsibilities under the Contract Documents with respect to the review of the submission. All submissions will be identified as the Contracting Officer may require. The data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials and similar data to enable the Contracting Officer to review the information as required.

6.20.2 The CONTRACTOR shall also submit to the Contracting Officer for review and approval with such promptness as to cause no delay in Work, all samples required by the Contract Documents. All samples will have been checked by and accompanied by a specific written indication that the CONTRACTOR has satisfied CONTRACTOR's responsibilities under the Contract Documents with respect to the review of the submission and will be identified clearly as to material, Supplier, pertinent data such as catalog numbers and the use for which intended.

6.20.3 Before submission 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.

6.20.4 At the time of each submission the CONTRACTOR shall give the Contracting Officer specific written notice of each variation that the Shop Drawings or samples may have from the requirements of the Contract Documents, and, in addition, shall cause a specific notation to be made on each Shop Drawing submitted to the Contracting Officer for review and approval of each such variation. All variations of the proposed shop drawing from that specified will be identified in the submission and available maintenance, repair and replacement service will be indicated. The submittal will also contain an itemized estimate of all costs that will result directly or indirectly from acceptance of such variation, including costs of redesign and claims of other contractors affected by the resulting change, all of which shall be considered by the CITY in evaluating the proposed variation. If the variation may result in a change of Contract Time or Price, or contract responsibility, and is not minor in nature; the CONTRACTOR must submit a written request for Change Order with the variation to notify the CITY of his intent. The CITY may require the CONTRACTOR to furnish at the CONTRACTOR's expense additional data about the proposed variation. The Contracting Officer may reject any variation request which the Contracting Officer determines is not in the best interest of the CITY.

6.21 Shop Drawing and Sample Review:

6.21.1 The Contracting Officer will review with reasonable promptness Shop Drawings and samples, but the Contracting Officer's review will be only for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents and shall not extend to means, methods, techniques, sequences or procedures of construction (except where a specific means, method, technique, sequence or procedure of construction is indicated in or required by the Contract Documents) or to safety precautions or programs incident thereto. The review of a separate item as such will not indicate acceptance of the assembly in which the item functions. The CONTRACTOR shall make corrections required by the Contracting Officer and shall return the required number of corrected copies of Shop Drawings and submit as required new samples for review. The CONTRACTOR shall direct specific attention in writing to revisions other than the corrections called for by the Contracting Officer on previous submittals.

6.21.2 The Contracting Officer's review of Shop Drawings or samples shall not relieve CONTRACTOR from responsibility for any variation from the requirements of the Contract Documents unless the CONTRACTOR has in writing advised the Contracting Officer of each such variation at the time of submission as required by paragraph 6.20.4. The Contracting Officer if he so determines, may give written approval of each such variation by Change Order, except that, if the variation is minor and no Change Order has been requested a specific written notation thereof incorporated in or accompanying the Shop Drawing or sample review comments shall suffice as a modification. No approval by the Contracting Officer will relieve the

CONTRACTOR from responsibility for errors or omissions in the Shop Drawings or from responsibility for having complied with the provisions of paragraph 6.20.3.

6.21.3 Where a Shop Drawing or sample is required by the Specifications, any related Work performed prior to the Contracting Officer's review of the pertinent submission will be the sole expense and responsibility of the CONTRACTOR.

6.22 Maintenance During Construction:

The CONTRACTOR shall maintain the Work during construction and until Substantial Completion, at which time the responsibility for maintenance shall be established in accordance with paragraph 13.10.

6.23 Continuing the Work:

The CONTRACTOR shall carry on the Work and adhere to the progress schedule during all disputes or disagreements with the CITY. No work shall be delayed or postponed pending resolution of any disputes, disagreements, or claims except as the CONTRACTOR and the Contracting Officer may otherwise agree in writing.

6.24 Consent to Assignment:

The CONTRACTOR shall obtain the prior written consent of the Contracting Officer to any proposed assignment of any interest in, or part of this Contract. The consent to any assignment or transfer shall not operate to relieve the CONTRACTOR or his Sureties of any of his or its obligations under this Contract or the Performance Bonds. Nothing herein contained shall be construed to hinder, prevent, or affect an assignment of monies due, or to become due hereunder, made for the benefit of the CONTRACTOR's creditors pursuant to law.

6.25 Use of Explosives:

6.25.1 When the use of explosives is necessary for the prosecution of the Work, the CONTRACTOR shall exercise the utmost care not to endanger life or property, including new Work and shall follow all Regulatory Requirements applicable to the use of explosives. The CONTRACTOR shall be responsible for all damage resulting from the use of explosives.

6.25.2 All explosives shall be stored in a secure manner in compliance with all Regulatory Requirements, and all such storage places shall be clearly marked. Where no Regulatory Requirements apply, safe storage shall be provided not closer than 1,000 feet from any building, camping area, or place of human occupancy.

6.25.3 The CONTRACTOR shall notify each public utility owner having structures in proximity to the site of his intention to use explosives. Such notice shall be given sufficiently in advance to enable utility owners to take such steps as they may deem necessary to protect their property from injury. However, the CONTRACTOR shall be responsible for all damage resulting from the use of the explosives, whether or not, utility owners act to protect their property.

6.26 CONTRACTOR's Records:

6.26.1 Records of CONTRACTOR and Subcontractors relating to personnel, payrolls, invoices of materials, and any and all other data relevant to the performance of the Contract, must be kept on a generally recognized accounting system. Such records must be available during normal work hours to the Contracting Officer for purposes of investigation to ascertain compliance with Regulatory Requirements and provision of the Contract Documents.

6.26.2 Payroll records must contain the name and address of each employee, his correct classification, rate of pay, daily and weekly number of hours of work, deductions made, and actual wages paid. The CONTRACTOR and Subcontractors shall make employment records available for inspection by the Contracting Officer and representatives of the State of Alaska Department of Labor and Workforce Development and will permit such representatives to interview employees during working hours on the Project.

6.26.3 Records of all communications between the CITY and the CONTRACTOR and other parties, where such communications affected performance of this Contract, must be kept by the CONTRACTOR and maintained

for a period of three years from Final Acceptance. The CITY or its assigned representative may perform an audit of these records during normal work hours after written notice to the CONTRACTOR.

ARTICLE 7 - LAWS AND REGULATIONS

7.1 Laws to be Observed:

The CONTRACTOR shall keep fully informed of all Regulatory Requirements and all orders and decrees of bodies or tribunals having any jurisdiction or authority, which in any manner affect those engaged or employed on the Work, or which in any way affect the conduct of the Work. The CONTRACTOR shall at all times observe and comply with all such Regulatory Requirements, orders and decrees; and shall protect and indemnify the CITY and its representatives against claim or liability arising from or based on the violation of any such Regulatory Requirement, order, or decree whether by the CONTRACTOR, Subcontractor, or any employee of either. Except where otherwise expressly required by applicable Regulatory Requirements, the CITY shall not be responsible for monitoring CONTRACTOR's compliance with any Regulatory Requirements.

7.2 Permits, Licenses, and Taxes:

7.2.1 The CONTRACTOR shall procure all permits and licenses, pay all charges, fees and taxes, and give all notices necessary and incidental to the due and lawful prosecution of the Work. As a condition of performance of this Contract, the CONTRACTOR shall pay all Federal, State and local taxes incurred by the CONTRACTOR, in the performance of the Contract. Proof of payment of these taxes is a condition precedent to final payment by the CITY under this Contract.

7.2.2 The CONTRACTOR's certification that taxes have been paid (as contained in the Release of Contract) may be verified with the Department of Revenue and Department of Labor and Workforce Development and Unalaska City Clerk, prior to final payment.

7.2.3 If any Federal, State or local tax is imposed, charged, or repealed after the date of Bid opening and is made applicable to and paid by the CONTRACTOR on the articles or supplies herein contracted for, then the Contract shall be increased or decreased accordingly by a Change Order.

7.2.4 The Contractor shall require all Subcontractors to obtain a City of Unalaska Business License.

7.3 Patented Devices, Materials and Processes:

If the CONTRACTOR employs any design, device, material, or process covered by letters of patent, trademark or copyright, the CONTRACTOR shall provide for such use by suitable legal agreement with the patentee or owner. The CONTRACTOR and the Surety shall indemnify and save harmless the CITY and its agents, any affected third party, from any and all claims for infringement by reason of the use of any such patented design, device, material or process, or any trademark or copyright, and shall indemnify the CITY for any costs, expenses, and damages which it may be obliged to pay by reason of any infringement, at any time during the prosecution or after the completion of the Work.

7.4 Compliance of Specifications and Drawings:

If the CONTRACTOR observes that the Specifications and Drawings supplied by the CITY are at variance with any Regulatory Requirements, CONTRACTOR shall give the Contracting Officer prompt written notice thereof, and any necessary changes will be authorized by one of the methods indicated in paragraph 9.2. as determined appropriate by the Contracting Officer. If the CONTRACTOR performs any Work knowing or having reason to know that it is contrary to such Regulatory Requirements, and without such notice to the Contracting Officer, the CONTRACTOR shall bear all costs arising therefrom; however, it shall not be the CONTRACTOR's primary responsibility to make certain that the Specifications and Drawings supplied by the CITY are in accordance with such Regulatory Requirements.

7.5 Accident Prevention:

The CONTRACTOR shall comply with AS 18.60.075 and all pertinent provisions of the Construction Code Occupational Safety and Health Standards issued by the Alaska Department of Labor.

7.6 Sanitary Provisions:

The CONTRACTOR shall provide and maintain in a neat and sanitary condition such accommodations for the use of his employees and CITY representatives as may be necessary to comply with the Regulatory requirements.

7.7 Business Registration:

The Contractor shall comply with AS 08.18.011 which states, as follows: "it is unlawful for a person to submit a bid or work as a contractor until he has been issued a certificate of registration by the Department of Commerce. A partnership or joint venture shall be considered registered if one of the general partners or ventures whose name appears in the name under which the partnership or venture does business is registered." The Contractor shall obtain a City of Unalaska Business License prior to commencement of the Work to the extent required by the City of Unalaska Code of Ordinances section 9.30.101.

7.8 Professional Registration and Certification:

All craft trades, architects, engineers and land surveyors, electrical administrators, explosive handlers, and welders employed under the Contract shall specifically comply with applicable provisions of AS 08.18, 08.48, 08.40, 08.52, and 08.99. Provide copies of individual licenses within seven days following a request from the Contracting Officer.

7.9 Local Building Codes:

The CONTRACTOR shall comply with AS 35.10.025 which requires construction in accordance with applicable local building codes including the obtaining of required permits. City of Unalaska permits required for the work are identified in the Supplemental Conditions.

7.10 Air Quality Control:

The CONTRACTOR shall comply with all applicable provision of AS 46.03.04 as pertains to Air Pollution Control.

7.11 Archaeological or Paleontological Discoveries:

When the CONTRACTOR's operation encounters prehistoric artifacts, burials, remains of dwelling sites, or paleontological remains, such as shell heaps, land or sea mammal bones or tusks, the CONTRACTOR shall cease operations immediately and notify the Contracting Officer. 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 Contracting Officer 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 shall be covered by an appropriate Contract change document.

7.12 Not used.

7.13 Preferential Employment:

To the fullest extent allowed by law, the CONTRACTOR shall comply with AS 36.10, as amended, which provides for preferential employment of Alaska residents.

7.14 Wages and Hours of Labor:

7.14.1 One certified copy of all payrolls shall be submitted weekly to the State Department of Labor to assure compliance with AS 36.05.040, Filing Schedule of Employees Wages Paid and Other Information. The prime CONTRACTOR shall be responsible for the submission of certified copies of payrolls of all Subcontractors. The certification shall affirm that the payrolls are current and complete, that the wage rates contained therein are not less than the applicable rates referenced in these Contract Documents, and that the classification set forth for each laborer or mechanic conforms with the work he performed. The CONTRACTOR and his Subcontractors shall attend all hearings and conferences and produce such books, papers, and documents all as requested by the Department of Labor. Should Federal funds be involved, the Contracting Agency shall also receive a copy of the CONTRACTOR's certified payrolls.

7.14.2 The following Labor provisions shall also apply to this Contract:

a. The CONTRACTOR and his Subcontractors shall pay all employees unconditionally and not less than once a week;

b. Wages may not be less than those stated in the advertised specifications, regardless of the contractual relationship between the CONTRACTOR or Subcontractors and laborers, mechanics, or field surveyors;

c. The scale of wages to be paid shall be posted by the CONTRACTOR in a prominent and easily accessible place at the site of the work;

d. The CITY shall withhold so much of the accrued payments as is necessary to pay laborers, mechanics, or field surveyors employed by the CONTRACTOR or Subcontractors the difference between

1. the rates of wages required by the contract to be paid laborers, mechanics, or field surveyors on the work, and

2. the rates of wages in fact received by laborers, mechanics or field surveyors.

7.15 Overtime Work Hours and Compensation:

Pursuant to 40 U.S.C. 327-330 and AS 23.10.060, the CONTRACTOR shall not require nor permit any laborer or mechanic in any workweek in which he is employed on any work under this Contract to work in excess of eight hours in any Calendar Day or in excess of forty hours in such workweek on work subject to the provisions of the Contract Work Hours and Safety Standards Act unless such laborer or mechanic receives compensation at a rate not less than one and one half times his basic rate of pay for all such hours worked in excess of eight hours in any Calendar Day or in excess of forty hours in such workweek whichever is the greater number of overtime hours. In the event of any violation of this provision, the CONTRACTOR shall be liable to any affected employee for any amounts due and penalties and to the CITY for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic employed in violation of this provision in the sum of $10.00 for each Calendar Day on which such employee was required or permitted to be employed on such work in excess of eight hours or in excess of the standard workweek of forty hours without payment of the overtime wages required by this paragraph.

7.16 Covenant Against Contingent Fees:

The CONTRACTOR warrants that no person or selling agent has been employed or retained to solicit or secure this Contract upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee. For breach or violation of this warranty, the CITY shall have the right to annul this Contract without liability or, in its discretion, to deduct price of consideration from the Contract or otherwise recover the full amount of such commission, percentage, brokerage, or contingent fee.

7.17 Officials Not to Benefit:

No member of or delegate to the U.S. Congress, the State Legislature, Unalaska City Council or other State or City Officials shall be admitted to any share or part of this Contract, nor to any benefit that may arise there from. However, this provision shall not be construed to extend to this Contract if made with a corporation for its general benefits.

7.18 Personal Liability of Public Officials:

In carrying out any of the provisions thereof, or in exercising any power or authority granted to the Contracting Officer by the Contract, there will be no liability upon the City nor upon its agents or authorized as its representatives, either personally or as officials of the City of Unalaska, it being always understood that in such matters they act as agents and representatives of the CITY.

ARTICLE 8 - OTHER WORK

8.1 Related Work at Site:

8.1.1 The CITY reserves the right at any time to contract for and perform other or additional work on or near the Work covered by the Contract.

8.1.2 When separate contracts are let within the limits of the Project, the CONTRACTOR shall conduct his Work so as not to interfere with or hinder the work being performed by other contractors. The CONTRACTOR shall join his work with that of the others in an acceptable manner and shall perform it in proper sequence to that of others.

8.1.3 If the fact that other such work to be performed is identified or shown in the Contract Documents, the CONTRACTOR shall assume all liability, financial or otherwise, in connection with this Contract and indemnify and save harmless the City of Unalaska and its agents from any and all damages or claims that may arise because of inconvenience, delay, or loss experienced by the CONTRACTOR because of the presence and operations of other contractors.

8.1.4 If the fact that such other work to be performed was not identified or shown in the Contract Documents, written notice thereof will be given to the CONTRACTOR prior to starting any such other work. If the CONTRACTOR believes that such performance will require an increase in Contract Price or Contract Time, the CONTRACTOR shall notify the Contracting Officer of such required increase within fifteen (15) calendar days following receipt of the Contracting Officer's notice. Should the Contracting Officer find such increase(s) to be justified, a Change Order will be executed.

8.2 Access, Cutting, and Patching:

The CONTRACTOR shall afford each utility owner and any other contractor who is a party to such a direct contract with the CITY (or the CITY, if the CITY is performing the additional work with the CITY'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 the work of others. 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 such other work with the written consent of the Contracting Officer. The duties and responsibilities of the CONTRACTOR under this paragraph are for the benefit of other contractors to the extent that there are comparable provisions for the benefit of the CONTRACTOR in said direct contracts between the CITY and other contractors.

8.3 Defective Work by Others:

If any part of the CONTRACTOR's Work depends for proper execution or results upon the work of any such other contractor, utility owner, or the CITY, the CONTRACTOR shall inspect and promptly report to the Contracting Officer in writing any delays, defects or deficiencies in such work that render it unavailable or unsuitable for such proper execution and results. The CONTRACTOR's failure to so report will constitute an acceptance of the other work as fit and proper for integration with CONTRACTOR's Work except for latent or non apparent defects and deficiencies in the other work.

8.4 Coordination:

If the CITY contracts with others for the performance of other work at the site, Contracting Officer will have authority and responsibility for coordination of the activities among the various prime contractors.

ARTICLE 9 - CHANGES

9.1 CITY's Right to Change:

Without invalidating the Contract and without notice to any Surety, the CITY may, at any time or from time to time, order additions, deletions or revisions in the Work within the general scope of the Contract, including but not limited to changes:

9.1.1 In the Contract Documents;

9.1.2 In the method or manner of performance of the Work;

9.1.3 In City-furnished facilities, equipment, materials, services, or site;

9.1.4 Directing acceleration in the performance of the Work.

9.2 Authorization of Changes within the General Scope:

Additions, deletions, or revisions in the Work within the general scope of the Contract as specified in 9.1 shall be authorized by one or more of the following ways:

9.2.1 Directive (pursuant to paragraph 9.3)

9.2.2 A Change Order (pursuant to paragraph 9.5)

9.2.3 CITY's acceptance of Shop Drawing variations from the Contract Documents as specifically identified by the CONTRACTOR as required by paragraph 6.20.4.

9.3 Directives:

9.3.1 The Contracting Officer shall provide written clarification or interpretation of the contract documents (pursuant to paragraph 3.6).

9.3.2 The Contracting Officer may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Time and are consistent with the overall intent of the Contract Documents.

9.3.3 The Contracting Officer may order the Contractor to correct Defective Work or methods which are not in conformance with the Contract Documents.

9.3.4 The Contracting Officer may direct the commencement or suspension of Work or emergency related work (as provided in paragraph 6.19).

9.3.5 Upon the issuance of a Directive to the CONTRACTOR by the Contracting Officer, the CONTRACTOR shall immediately proceed with the performance of the work as prescribed by such Directive.

9.3.6 If the CONTRACTOR believes that the changes noted in a Directive may cause an increase in the Contract Price or an extension of Contract Time, the CONTRACTOR shall immediately provide written notice to the Contracting Officer depicting such increases before proceeding with the Directive, except in the case of an emergency. If the Contracting Officer finds the increase in Contract Price or the extension of Contract Time justified, a Change Order will be issued. If however, the Contracting Officer does not find that a Change Order is justified, the Contracting Officer may direct the CONTRACTOR to proceed with the work. The CONTRACTOR shall cooperate with the Contracting Officer in keeping complete daily records of the cost of such work. If a Change Order is ultimately determined to be justified, in the absence of agreed prices and unit prices, payment for such work will be made on a cost of the work basis as provided in 10.4.

9.4 Change Order:

A change in Contract Time, Contract Price, or responsibility may be made for changes within the scope of the Work only by Change Order. Upon receipt of an executed Change Order, the CONTRACTOR shall promptly proceed with the work involved which will be performed under the applicable conditions of the Contract Documents except as otherwise specifically provided. Changes in Contract Price and Contract Time shall be made in accordance with Article 10 and 11.

9.5 Shop Drawing Variations:

Variations by shop drawings shall only be eligible for consideration under 9.4 when the conditions affecting the price, time, or responsibility are identified by the CONTRACTOR in writing and a request for a Change Order is submitted as per 6.20.4.

9.6 Changes Outside the General Scope; Supplemental Agreement:

Any change which is outside the general scope of the Contract, as determined by the Contracting Officer, must be authorized by the appropriate representatives of the CITY and the CONTRACTOR.

9.7 Unauthorized Work:

The CONTRACTOR shall not be entitled to an increase in the Contract Price or an extension of the Contract Time with respect to any work performed that is not required by the Contract Documents as amended, modified and supplemented as provided in this Article 9, except in the case of an emergency as provided in paragraph 6.19 and except in the case of uncovering Work as provided in paragraph 12.4.2.

9.8 Notification of Surety:

If notice of any change affecting the general scope of the Work or the provisions of the Contract Documents including, but not limited to, Contract Price or Contract Time 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 will be adjusted accordingly.

9.9 Differing Site Conditions:

9.9.1 The CONTRACTOR shall promptly, and before such conditions are disturbed (except in an emergency as permitted by paragraph 6.19), notify the Contracting Officer in writing of: (1) subsurface or latent physical conditions at the site differing materially from those indicated in the Contract, and which could not have been discovered by a careful examination of the site, or (2) unknown physical conditions at the site, or an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in this Contract. The Contracting Officer shall promptly investigate the conditions, and if the Contracting Officer finds that such conditions do materially so differ and cause an increase or decrease in the CONTRACTOR's cost of, or time required for, performance of this Contract, an equitable adjustment shall be made and the Contract modified in writing accordingly.

9.9.2 Any claim for additional compensation by the CONTRACTOR under this clause shall be made in accordance with Article 15 and shall not be allowed unless the CONTRACTOR has first given the notice required by this Contract. In the event that the Contracting Officer and the CONTRACTOR are unable to reach an agreement concerning an alleged differing site condition, the CONTRACTOR will be required to keep an accurate and detailed record which will indicate the actual cost of the work done under the alleged differing site condition. Failure to keep such a record shall be a bar to any recovery by reason of such alleged differing site conditions. The Contracting Officer shall be given the opportunity to supervise and check the keeping of such records.

ARTICLE 10 - CONTRACT PRICE; COMPUTATION AND CHANGE

10.1 Contract Price:

The Contract Price constitutes the total compensation (subject to authorized adjustments) payable to the CONTRACTOR for performing the Work. All duties, responsibilities and obligations assigned to or undertaken by the CONTRACTOR shall be at his expense without change in the Contract Price. The Contract Price may only be changed by a Change Order or Supplemental Agreement.

10.2 Claim for Price Change:

Any claim for an increase or decrease in the Contract Price shall be submitted in accordance with the terms of Article 15, and shall not be allowed unless notice requirements of this Contract have been met.

10.3 Change Order Price Determination:

The value of any work covered by a Change Order for an increase or decrease in the Contract Price shall be determined in one of the following ways:

10.3.1 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 (subject to the provisions of paragraphs 10.9.1

10.3.2 By mutual acceptance of a lump sum price which includes overhead and profit.

10.3.3 When 10.3.1 and 10.3.2 are inapplicable, on the basis of the Cost of the Work (determined as provided in paragraphs 10.4 and 10.5) plus a CONTRACTORS's fee for overhead and profit (determined as provided in paragraph 10.6).

10.4 Cost of the Work:

The term Cost of the Work means the sum of all costs necessarily incurred and paid by the CONTRACTOR in the proper performance of the work. Except as otherwise may be agreed to in writing by the CITY, such costs shall be in amount no higher than those prevailing in the locality of the Project, shall include only the following items and shall not include any of the costs itemized in paragraph 10.5:

10.4.1 Payroll costs for employees in the direct employ of the CONTRACTOR in the performance of the work under schedules of job classifications agreed upon by the CITY and the CONTRACTOR. Payroll costs for employees not employed full time on the work shall be apportioned on the basis of their time spent on the work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits which shall include social security contributions, unemployment, excise and payroll taxes, workers' or workmen's compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. Such employees shall include superintendents and foremen at the site. The expenses of performing work after regular working hours, on Saturday, Sunday or legal holidays, shall be included in the above to the extent authorized by the CITY.

10.4.2 Cost of all materials and equipment furnished and incorporated in the work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to the CONTRACTOR unless the CITY deposits funds with the CONTRACTOR with which to make payments, in which case the cash discounts shall accrue to the CITY. All trade discounts, rebates and refunds and all returns from sale of surplus materials and equipment shall accrue to the CITY, and the CONTRACTOR shall make provisions so that they may be obtained.

10.4.3 Payments made by the CONTRACTOR to Subcontractors for work performed by Subcontractors. If required by the CITY, CONTRACTOR shall obtain competitive quotes from Subcontractors or Suppliers acceptable to the CONTRACTOR and shall deliver such quotes to the CITY who will then determine which quotes will be accepted. If a subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work Plus a Fee, the Subcontractor's Cost of the Work shall be determined in the same manner as the CONTRACTOR's Cost of Work. All subcontracts shall be subject to the other provisions of the Contract Documents insofar as applicable.

10.4.4 Costs of special consultants (including but not limited to engineers, architects, testing laboratories, and surveyors) employed for services necessary for the completion of the work.

10.4.5 Supplemental costs including the following:

a. The proportion of necessary transportation, travel and subsistence expenses of the CONTRACTOR's employees incurred in discharge of duties connected with the work.

b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office and temporary facilities at the site and hand tools not owned by the workers, which are consumed in the performance of the work, and cost less market value of such items used but not consumed which remain the property of the CONTRACTOR.

c. Rentals of all construction equipment and machinery and the parts thereof whether rented from the CONTRACTOR or others in accordance with rental agreements approved by the CITY and the costs of transportation, loading, unloading, installation, dismantling and removal thereof - all in accordance with terms of said rental agreements. The rental of any such equipment, machinery or parts shall cease when the use thereof is no longer necessary for the work.

d. Sales, consumer, use or similar taxes related to the work, and for which the CONTRACTOR is liable, imposed by Regulatory Requirements.

e. Deposits lost for causes other than negligence of the CONTRACTOR, any Subcontractor or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

f. Losses and damages (and related expenses), not compensated by insurance or otherwise, to the Work or otherwise sustained by the CONTRACTOR in connection with the performance and furnishing of the Work provided they have resulted from causes other than the negligence of the CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of the CITY. No such losses, damages and expenses shall be included in the Cost of the Work for the purpose of determining the CONTRACTOR's Fee. If, however, any such loss or damage requires reconstruction and the CONTRACTOR is placed in charge thereof, the CONTRACTOR shall be paid for services a fee proportionate to that stated in paragraphs 10.6.2.a and 10.6.2.b.

g. The cost of utilities, fuel and sanitary facilities at the site.

h. Minor expenses such as long distance telephone calls, telephone service at the site, expressage and similar petty cash items in connection with the work.

i. Cost of premiums for additional bonds and insurance required because of changes in the work and premiums for property insurance coverage within the limits of the deductible amounts established by the CITY in accordance with Article 5.

10.5 Excluded Costs:

The term Cost of the Work shall not include any of the following:

10.5.1 Payroll costs and other compensation of CONTRACTOR's officer, executives, principals (of partnership and sole proprietorships), general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agency, expediters, 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 and not specifically included in the agreed upon schedule of job classifications referred to in paragraph 10.4.1 or specifically covered by paragraph 10.4.4 - all of which are to be considered administrative costs covered by the CONTRACTOR's Fee.

10.5.2 Expenses of CONTRACTOR's principal and branch offices other than CONTRACTOR's office at the site.

10.5.3 Any part of CONTRACTOR's capital expenses including interest on CONTRACTOR's capital employed for the Work and charges against CONTRACTOR for delinquent payments.

10.5.4 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 subparagraph 10.4.5.i above).

10.5.5 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.

10.5.6 Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in paragraph 10.4.

10.6 CONTRACTOR's Fee:

The CONTRACTOR's Fee allowed to CONTRACTOR for overhead and profit shall be determined as follows:

10.6.1 A mutually acceptable fixed fee; or if none can be agreed upon.

10.6.2 A fee based on the following percentages of the various portions of the Cost of the Work:

a. For costs incurred under paragraphs 10.4.1 and 10.4.2, the CONTRACTOR's Fee shall be twenty percent;

b. For costs incurred under paragraph 10.4.3, the CONTRACTOR's Fee shall be fifteen percent; and if a subcontract is on the basis of Cost of the Work Plus a Fee, the maximum allowable to CONTRACTOR on account of overhead and profit of all subcontractors shall be fifteen percent;

c. No fee shall be payable on the basis of costs itemized under paragraphs 10.4.4, 10.4.5 and 10.5;

d. The amount of credit to be allowed by the CONTRACTOR to the CITY for any such change which results in a net decrease in cost will be the amount of the actual net decrease plus a deduction in CONTRACTOR's Fee by an amount equal to ten percent of the net decrease; and

e. When both additions and credits are involved in any one change, the adjustment in CONTRACTOR's Fee shall be computed on the basis of the net change in accordance with paragraphs 10.6.2.a through 10.6.2.d, inclusive.

10.7 Cost Breakdown:

Whenever the cost of any work is to be determined pursuant to paragraphs 10.4 and 10.5, the CONTRACTOR will submit in form acceptable to the CITY an itemized cost breakdown together with supporting data.

10.8 Cash Allowances:

It is understood the CONTRACTOR has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be done by such Subcontractors or Suppliers and for such sums within the limit of the allowances as may be acceptable to the Contracting Officer. CONTRACTOR agrees that:

10.8.1 The allowances include the cost to CONTRACTOR (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the site, and all applicable taxes; and

10.8.2 CONTRACTOR's cost for unloading and handling on the site, labor, installation costs, overhead, profit and other expenses contemplated for the allowances have been included in the Contract Price and not in the allowances. No demand for additional payment on account of any thereof will be valid.

Prior to final payment, an appropriate Change Order will be issued to reflect actual amounts due the CONTRACTOR on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

10.9 Unit Price Work:

10.9.1 Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the established unit prices for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Contract. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by the CONTRACTOR will be made by the CITY in accordance with paragraph 10.9.3.

10.9.2 Each unit price will be deemed to include an amount considered by the CONTRACTOR to be adequate to cover the CONTRACTOR's overhead and profit for each separately identified item. If the "Basis of Payment" clause in the Contract Documents relating to any unit price in the bid schedule requires that the said unit price cover and be considered compensation for certain work or material essential to the item, this same work or material will not also be measured or paid for under any other pay item which may appear elsewhere in the Contract Documents.

10.9.3 Payment to the CONTRACTOR shall be made only for the actual quantities of work performed and accepted or materials furnished, in conformance with the Contract Documents. When the accepted quantities of work or materials vary from the quantities stated in the bid schedule, or change documents, the CONTRACTOR shall accept as payment in full, payment at the stated unit prices for the accepted quantities or work and materials furnished, completed and accepted; except as provided below:

a. When the quantity of work to be done or material to be furnished under any item, for which the total cost of the item exceeds 10% of the total Contract Price, is increased by more the 25 per cent of the quantity stated in the bid schedule, or change documents, either party to the Contract, upon demand, shall be entitled to an equitable unit price adjustment on the portion of the work above 125 per cent of the quantity stated in the bid schedule.

b. When the quantity of work to be done or material to be furnished under any major item, for which the total cost of the item exceeds 10% of the total Contract Price, is decreased by more than 25 per cent of the quantity stated in the bid schedule, or change documents either party to the contract, upon demand, shall be entitled to an equitable price adjustment for the quantity of work performed or material furnished, limited to a total payment of not more the 75 per cent of the amount originally bid for the item.

10.10 Determinations for Unit Prices:

The Contracting Officer will determine the actual quantities and classifications of Unit Price Work performed by the CONTRACTOR . The Contracting Officer will review with the CONTRACTOR preliminary determinations on such matters before certifying the prices on the Bid Schedule. The Contracting Officer's certification thereon will be final and binding on the CONTRACTOR, unless, within ten days after the date of any such decisions, the CONTRACTOR delivers to the Contracting Officer written notice of intention to appeal from such a decision.

ARTICLE 11 - CONTRACT TIME; COMPUTATION AND CHANGE

11.1 Commencement of Contract Time; Notice to Proceed:

The Contract Time will commence to run on the day indicated in the Notice to Proceed.

11.2 Starting the Work:

No work on contract items shall be performed before the effective date of the Notice to Proceed. The CONTRACTOR shall notify the Contracting Officer at lease 24 hours in advance of the time actual construction operations will begin. The CONTRACTOR may request a limited Notice to Proceed after award has been made, to permit him to order long lead materials which could cause delays in project completion. However, granting is within the sole discretion of the Contracting Officer, and refusal or failure to grant a limited Notice to Proceed shall not be a basis for claiming for delay, extension of time, or alteration of price.

11.3 Computation of Contract Time:

11.3.1 When the contract time is specified on a calendar days basis, all work under the contract shall be completed within the number of calendar days specified. The count of contract time begins on the day following receipt of the Notice to Proceed by the CONTRACTOR, if no starting day is stipulated therein. Calendar days shall continue to be counted against contract time until and including the date of Final Completion of the Work.

11.3.2 When the Contract completion time is specified as a fixed calendar date, it shall be the date of Final Completion.

11.4 Time Change:

The Contract Time may only be changed by a Change Order or Supplemental Agreement.

11.5 Extension Due to Delays:

The right of the CONTRACTOR to proceed shall not be terminated nor the CONTRACTOR charged with liquidated or actual damages because of any delays to the completion of the Work due to unforeseeable causes beyond the control and without the fault or negligence of the CONTRACTOR, including, but not restricted to the following: acts of God or of the public enemy, acts of the CITY in contractual capacity, acts of another contractor in the performance of a contract with the CITY, floods, fires, epidemics, quarantine restrictions, strikes, freight embargoes, unusually severe weather and delays of Subcontractors or Suppliers due to such causes. Any delay in receipt of materials on the site, caused by other than one of the specifically mentioned occurrences above, does not of itself justify a time extension. Provided, that the CONTRACTOR shall within twenty four (24) hours from the beginning of any such delay (unless the Contracting Officer shall grant a further period of the time prior to the date of final settlement of the Contract) notify the Contracting Officer in writing of the cause of delay. The Contracting Officer shall ascertain the facts and the extent of the delay and extend the time for completing the Work when the findings of fact justify such an extension.

11.6 Essence of Contract:

All time limits stated in the Contract Documents are of the essence of the Contract.

11.7 Reasonable Completion Time:

It is expressly understood and agreed by and between the CONTRACTOR and the CITY that the date of beginning and the time for Final Completion of the Work described herein are reasonable times for the completion of the Work.

11.8 Delay Damages:

Whether or not the CONTRACTOR's right to proceed with the Work is terminated, he and his sureties shall be liable for damages resulting from his refusal or failure to complete the Work within the specified time. Liquidated damages for delay shall be paid by the CONTRACTOR or his Surety to the City in the amount as specified in the Agreement or the Supplementary Conditions for each Calendar Day the completion of the Work or any part thereof is delayed beyond the Contract Time required by the Contract, or any extension thereof. If such amount of liquidated damages is not established by the Contract Documents, then the CONTRACTOR and his Surety shall be liable to the City for any actual damages occasioned by such delay. The CONTRACTOR acknowledges that the liquidated damages established herein are not a penalty but rather constitute an estimate of damages that the City will sustain by reason of delayed completion. These liquidated damages are intended as compensation for losses difficult to estimate, and include those items enumerated in the Supplementary Conditions or elsewhere in the Contract Documents. These damages will continue to run both before and after termination in the event of default termination. These liquidated damages do not cover excess costs of completion or the CITY's costs, fees, and charges related to reprocurement. If a default termination occurs, the Contractor or his Surety shall pay in addition to these damages, all excess costs and expenses related to completion as provided by Article 14.2.5.

ARTICLE 12 - QUALITY ASSURANCE

12.1 Warranty and Guaranty:

The CONTRACTOR warrants and guarantees to the CITY that all Work will be in accordance with the Contract Documents and will not be Defective. Prompt notice of all defects shall be given to the CONTRACTOR. All Defective Work, whether or not in place, may be rejected, corrected or accepted as provided for in this Article.

12.2 Access to Work:

The CITY and the CITY's representatives, testing agencies and governmental agencies with jurisdiction interests will have access to the Work at reasonable times for their observation, inspecting and testing. The CONTRACTOR shall provide proper and safe conditions for such access.

12.3 Tests and Inspections:

12.3.1 The CONTRACTOR shall give the Contracting Officer timely notice of readiness of the Work for all required inspections, tests or approvals.

12.3.2 If Regulatory Requirements require any Work (or part thereof) to specifically be inspected, tested or approved, the CONTRACTOR shall assume full responsibility therefor, pay all costs in connection therewith and furnish the Contracting Officer the required certificates of inspection, testing or approval. The CONTRACTOR shall also be responsible for and shall pay all costs in connection with any inspection or testing required in connection with CITY's acceptance of a Supplier of materials or equipment proposed to be incorporated in the Work, or of materials or equipment submitted for approval 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 CONTRACTOR. The CITY may perform additional tests and inspections which it deems necessary to insure quality control. All such failed tests or inspections shall be at the CONTRACTOR's expense.

12.3.3 If any Work (including the work of others) that is to be inspected, tested or approved is covered without written concurrence of the Contracting Officer, it must, if requested by the Contracting Officer, be uncovered for observation. Such uncovering shall be at the CONTRACTOR's expense unless the CONTRACTOR has given the Contracting Officer timely notice of CONTRACTOR's intention to cover the same and the Contracting Officer has not acted with reasonable promptness in response to such notice.

12.3.4 Neither observations nor inspections, test or approvals by the CITY of others shall relieve the CONTRACTOR from the CONTRACTOR's obligations to perform the Work in accordance with the Contract Documents.

12.4 Uncovering Work:

12.4.1 If any Work is covered contrary to the written request of the Contracting Officer, it must, if requested by the Contracting Officer, be uncovered for the contracting Officer's observation and replaced at the CONTRACTOR's expense.

12.4.2 If the Contracting Officer considers it necessary or advisable that covered Work be observed, inspected or tested, the CONTRACTOR, at the Contracting Officer's request, shall uncover, expose or otherwise make available for observation, inspection or testing as the Contracting Officer 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 of such uncovering, exposure, observation, inspection and testing and of satisfactory reconstruction, (including but not limited to fees and charges of engineers, architects, attorneys and other professionals) and the CITY shall be entitled to an appropriate decrease in the Contract Price. If, however, 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.

12.5 CITY May Stop the Work:

If the Work is Defective, or the CONTRACTOR fails to supply suitable materials or equipment, or fails to furnish or perform the Work in such a way that the completed Work will conform to the Contract Documents, the Contracting Officer 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 Contracting Officer to stop the Work shall not give rise to any duty on the part of the Contracting Officer to exercise this right for the benefit of the CONTRACTOR.

12.6 Correction or Removal of Defective Work:

If required by the Contracting Officer, the CONTRACTOR shall promptly, as directed, either correct all Defective Work, whether or not fabricated, installed or completed, or, if the Work has been rejected by the Contracting Officer, remove it from the site and replace it with Work which conforms to the requirements of the Contract Documents. The

CONTRACTOR shall bear all direct, indirect and consequential costs of such correction or removal (including but not limited to fees and charges of engineers, architects, attorneys and other professionals) made necessary thereby.

12.7 One Year Correction Period:

If within one year after the date of Final Completion or such longer period of time as may be prescribed by Regulatory Requirements 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 CITY and in accordance with the Contracting Officer's written instructions, either correct such Defective Work, or, if it has been rejected by the Contracting Officer, remove it from the site and replace it with conforming Work. If the CONTRACTOR does not promptly comply with the terms of such instructions, or in an emergency where delay would cause serious risk of loss or damage, the CITY may have the Defective Work corrected or the rejected Work removed and replaced, and all direct, indirect and consequential costs of such removal and replacement (including but not limited to fees and charges of engineers, architects, attorneys and other professionals) will be paid by the CONTRACTOR. In special circumstances where a particular item of equipment is placed in continuous service for the benefit of the CITY before Substantial Completion of all the Work, the correction period for the item may begin on an earlier date if so provided in the Specifications or by Change Order. Provisions of this paragraph are not intended to shorten the Statute of Limitations for bringing an action.

12.8 Acceptance of Defective Work:

Instead of requiring correction or removal and replacement of Defective Work, the Contracting Officer may accept Defective Work, the CONTRACTOR shall bear all direct, indirect and consequential costs attributable to the Contracting Officer's evaluation of and determination to accept such Defective Work (costs to include but not be limited to fees and charges of engineers, architects, attorneys and other professionals). 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 CITY shall be entitled to an appropriate decrease in the Contract Price. If the CITY has already made final payment to the CONTRACTOR, an appropriate amount shall be paid by the CONTRACTOR or his Surety to the CITY.

12.9 CITY May Correct Defective Work:

If the CONTRACTOR fails within a reasonable time after written notice from the Contracting Officer to proceed to correct Defective Work or to remove and replace rejected Work as required by the Contracting Officer in accordance with paragraph 12.6, or if the CONTRACTOR fails to perform the Work in accordance with the Contract Documents, or if the CONTRACTOR fails to comply with any other provision of the Contract Documents, the CITY may, after seven days' written notice to the CONTRACTOR, correct and remedy any such deficiency. In exercising the rights and remedies under this paragraph the CITY shall proceed expeditiously. To the extent necessary to complete corrective and remedial action, the Contracting Officer may exclude the CONTRACTOR from all or part of the site, take possession of all or part of the Work, and suspend the CONTRACTOR's services related thereto, take possession of the CONTRACTOR's tool, appliances, construction equipment and machinery at the site and incorporate in the Work all materials and equipment stored at the site or approved remote storage sites or for which the CITY has paid the CONTRACTOR but which are stored elsewhere, the CONTRACTOR shall allow the Contracting Officer and his authorized representatives such access to the site as may be necessary to enable the Contracting Officer to exercise the rights and remedies under this paragraph. All direct, indirect and consequential costs of the CITY or its agents in exercising such rights and remedies will be charged against the CONTRACTOR, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and the CITY shall be entitled to an appropriate decrease in the Contract Price. Such direct, indirect and consequential costs will include but not be limited to fees and charges of engineers, architects, attorneys and other professionals, all court and arbitration costs and all cost of repair and replacement of work of others destroyed or damaged by correction, removal or replacement of the CONTRACTOR's Defective Work. The CONTRACTOR shall not be allowed an extension of the Contract Time because of any delay in performance of the Work attributable to the exercise by the Contracting Officer of the CITY's rights and remedies hereunder.

ARTICLE 13 - PAYMENTS TO CONTRACTOR AND COMPLETION

13.1 Schedule of Values:

The Schedule of Values established as provided in paragraph 6.6 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to the Contracting Officer. Progress payments on account of Unit Price Work will be based on the number of units completed.

13.2 Preliminary Payments:

Upon approval of the Schedule of Values the CONTRACTOR may be paid for direct costs substantiated by paid invoices and other prerequisite documents required by the General Requirements. Direct costs shall include the cost of Bonds, insurance, approved materials stored on the site or at approved remote storage sites, deposits required by a Supplier prior to fabricating materials, and other approved direct mobilization costs substantiated as indicated above. These payments shall be included as a part of the total Contract Price as stated in the Contract.

13.3 Application for Progress Payment:

The CONTRACTOR shall submit to the Contracting Officer for review an Application for Payment filled out and signed by the CONTRACTOR covering the Work completed as of the date of the Application for Payment and accompanied by such supporting documentation as is required by the Contract Documents. Progress payments will be made as the Work progresses on a monthly basis or twice a month when requested by the CONTRACTOR, but only when the approved invoice exceeds $10,000.00.

13.4 Review of Applications for Progress Payments:

Contracting Officer will, either indicate in writing a recommendation of payment, or return the Application for Payment to the CONTRACTOR indicating in writing the Contracting Officer's reasons for refusing to recommend payment. If the latter case, the CONTRACTOR may make the necessary corrections and resubmit the Application for Payment.

13.5 Stored Materials and Equipment:

If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice or other documentation warranting that the CITY has received the materials and equipment free and clear of all charges, security interests and encumbrances and evidence that the materials and equipment are covered by appropriate property insurance and other arrangements to protect the CITY's interest therein, all of which will be satisfactory to the Contracting Officer. No payment will be made for perishable materials that could be rendered useless because of long storage periods. No progress payment will be made for living plant materials until planted. The payment may be reduced by an amount equal to transportation and handling cost if the materials are stored offsite, in a remote location, or will require special handling.

13.6 CONTRACTOR's Warranty of Title:

The CONTRACTOR warrants and guarantees that title to all Work, materials and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to the CITY no later than the time of payment free and clear of any claims, liens, security interests and further obligations.

13.7 Withholding of Payments:

The CITY may withhold or refuse payment for any of the reasons listed below provided it gives written notice of its intent to withhold and of the basis for withholding:

13.7.1 The Work is Defective, or completed Work has been damaged requiring correction or replacement, or has been installed without approval of Shop Drawing, or by an unapproved Subcontractor.

13.7.2 The Contract Price has been reduced by Change Order.

13.7.3 The CITY has been required to correct Defective Work or complete Work in accordance with paragraph 12.9.

13.7.4 The CITY's actual knowledge of the occurrence of any of the events enumerated in paragraphs 14.2.1.a through 14.2.1.k inclusive.

13.7.5 Claims have been made against the CITY or against the funds held by the CITY on account of the CONTRACTOR's actions or inactions in performing this Contract, or there are other items entitling the CITY to a set off.

13.7.6 Subsequently discovered evidence or the results of subsequent inspections or test, nullify any previous payments for reasons stated in subparagraphs 13.7.1 through 13.7.5.

13.7.7 The CONTRACTOR has failed to fulfill or is in violation of any of his obligations under any provision of this Contract.

13.8 Retainage:

At any time the CITY finds that satisfactory progress is not being made it may in addition to the amounts withheld under 13.7 retain a maximum amount equal to 10% of the total amount earned on all subsequent progress payments. This retainage may be released at such time as the Contracting Officer finds that satisfactory progress is being made.

13.9 Request for Release of Funds:

If the CONTRACTOR believes the basis for withholding is invalid or no longer exists, immediate written notice of the facts and Contract provisions on which the CONTRACTOR relies, shall be given to the CITY, together with a request for release of funds and adequate documentary evidence proving that the problem has been cured. In the case of withholding which has occurred at the request of the Department of Labor and Workforce Development, the CONTRACTOR shall provide a letter from the Department of Labor stating that withholding is no longer requested. Following such a submittal by the CONTRACTOR, the CITY shall have a reasonable time to investigate and verify the facts and seek additional assurances before determining whether release of withheld payments is justified.

13.10 Substantial Completion:

When the CONTRACTOR considers the Work ready for its intended use the CONTRACTOR shall notify the Contracting Officer in writing that the Work or a designated portion thereof is substantially complete (except for items specifically listed by the CONTRACTOR as incomplete) and request that the CITY issue a certificate of Substantial Completion. Within a reasonable time thereafter, the Contracting Officer, the CONTRACTOR and appropriate Consultant(s) shall make an inspection of the Work to determine the status of completion. If the Contracting Officer does not consider the Work substantially complete, the Contracting Officer will notify the CONTRACTOR in writing giving the reasons therefor. If the Contracting Officer considers the Work substantially complete, the Contracting Officer will within fourteen days execute and deliver to the CONTRACTOR a certificate of Substantial Completion with tentative list of items to be completed or corrected. At the time of delivery of the certificate of Substantial Completion the Contracting Officer will deliver to the CONTRACTOR a written division of responsibilities pending Final Completion with respect to security, operation, safety, maintenance, heat, utilities, insurance and warranties which shall be consistent with the terms of the Contract Documents. The CITY shall be responsible for all CITY costs resulting from the initial inspection and the first re-inspection, the CONTRACTOR shall pay all costs incurred by the CITY resulting from re-inspections, thereafter.

13.11 Access Following Substantial Completion:

The CITY shall have the right to exclude the CONTRACTOR from the Work after the date of Substantial Completion, but the CITY shall allow CONTRACTOR reasonable access to complete or correct items on the tentative list.

13.12 Final Inspection:

Upon written notice from the CONTRACTOR that the entire Work or an agreed portion thereof is complete, the Contracting Officer will make a final inspection with the CONTRACTOR and appropriate Consultants and will notify the CONTRACTOR in writing of all particulars in which this inspection reveals that the Work is incomplete or Defective.

The CONTRACTOR shall immediately take such measures as are necessary to remedy such deficiencies. The CONTRACTOR shall pay for all costs incurred by the CITY resulting from re-inspections.

13.13 Final Application for Payment:

After the CONTRACTOR has completed all such corrections to the satisfaction of the Contracting Officer and delivered all maintenance and operating instructions, schedules, guarantees, bonds, certificates of payment to all laborers, Subcontractors and Suppliers, certificates of inspection, marked-up record documents and other documents - all as required by the Contract Documents, and after the Contracting Officer has indicated that the Work is acceptable (subject to the provisions of paragraph 13.17), the CONTRACTOR may make application for final payment following the procedure for progress payments. The final Application for Payment shall be accompanied by all certificates, warranties, guaranties, releases, affidavits, and other documentation required by the Contract Documents.

13.14 Final Payment and Final Completion:

13.14.1 If on the basis of the Contracting Officer's observation of the Work during construction and final inspection, and the Contracting Officer's review of the final Application for Payment and accompanying documentation - all as required by the Contract Documents, the Contracting Officer is satisfied that the Work has been completed and the CONTRACTOR's other obligations under the Contract Documents have been fulfilled, the CITY will process final Application for Payment. Otherwise, the Contracting Officer will return the Application for Payment to the CONTRACTOR, indicating in writing the reasons for refusing to process final payment, in which case the CONTRACTOR shall make the necessary corrections and resubmit the final Application for Payment.

13.14.2 If, through no fault of the CONTRACTOR, Final Completion of the Work is significantly delayed, the Contracting Officer shall, upon receipt of the CONTRACTOR's final Application for Payment, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by the CITY for Work not fully completed or corrected is less than the retainage provided for in paragraph 13.8, and if Bonds have been furnished as required in paragraph 5.1, the written consent of the Surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the CONTRACTOR to the CITY with the application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

13.14.3 In addition to other requirements, final payment shall not be due until CITY’s receipt of verification from the State of Alaska Department of Labor and Workforce Development (“the Department”) that (i) Contractor has complied with AS 36.05.045(a) and (ii) the Department is not conducting an investigation and (iii) the Department has not issued a notice of violation of AS 36.05 to Contractor or to any subcontractor.

13.15 Final Acceptance:

Following receipt of the CONTRACTOR's Release with no exceptions, and certification that laborers, Subcontractors and materialmen have been paid, certification of payment of payroll and sales taxes and revenue taxes, and final payment to the CONTRACTOR, the CITY will issue a letter of Final Acceptance, releasing the CONTRACTOR from further obligations under the Contract, except as provided in paragraph 13.16.

13.16 CONTRACTOR's Continuing Obligation:

The CONTRACTOR's obligation to perform and complete the Work and pay all laborers, Subcontractors, and materialmen in accordance with the Contract Documents shall be absolute. Neither any progress or final payment by the CITY, nor the issuance of a certificate of Substantial Completion, nor any use or occupancy of the Work or any part thereof by the CITY, nor any act of acceptance by the CITY nor any failure to do so, nor any review and approval of a Shop Drawing or sample submission, nor any correction of Defective Work by the CITY 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.

13.17 Waiver of Claims by CONTRACTOR:

The making and acceptance of final payment will constitute a waiver of all claims by the CONTRACTOR against the CITY other than those previously made in writing and still unsettled.

13.18 No Waiver of Legal Rights:

The CITY shall not be precluded or be stopped by any payment, measurement, estimate, or certificate made either before or after the completion and acceptance of the Work and payment therefor, from showing the true amount and character of the Work performed and materials furnished by the CONTRACTOR, nor from showing that any payment, measurement, estimate or certificate is untrue or is incorrectly made, or that the Work or materials are Defective. The CITY shall not be precluded or stopped, notwithstanding any such measurement, estimate, or certificate and payment in accordance therewith, from recovering from the CONTRACTOR or his Sureties, or both, such damages as it may sustain by reason of his failure to comply with requirements of the Contract Documents. Neither the acceptance by the CITY, or any representative of the CITY, nor any payment for or acceptance of the whole or any part of the Work, nor any extension of the Contract Time, nor any possession taken by the CITY, shall operate as a waiver of any portion of the Contract, or of the power herein reserved, or of any right to damages. A waiver by the CITY of any breach of the Contract shall not be held to be a waiver of any other subsequent breach.

ARTICLE 14 - SUSPENSION OF WORK, DEFAULT AND TERMINATION

14.1 CITY May Suspend Work:

14.1.1 The CITY may, at any time suspend the Work or any portion thereof by notice in writing to the CONTRACTOR. If the Work is suspended without cause the CONTRACTOR shall be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to any suspension if the CONTRACTOR makes an approved claim therefor as provided in Article 15. However, no adjustment shall be made under this clause for any suspension, delay, or interruption to the extent that suspension is due to the fault or negligence of the CONTRACTOR, or that suspension is necessary for Contract compliance, or that performance would have been so suspended, delayed, or interrupted by any other cause, including the fault or negligence of the CONTRACTOR.

14.1.2 In case of suspension of Work, the CONTRACTOR shall be responsible for preventing damage to or loss of any of the Work already performed and of all materials whether stored on or off the site or approved remote storage sites.

14.2 Default of Contract:

14.2.1 If the CONTRACTOR:

a. Fails to begin the Work under the Contract within the time specified in the "Proposal", or

b. Fails to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workmen or suitable materials or equipment or failure to adhere to the progress schedule established under paragraph 6.6 as revised from time to time), or

c. Performs the Work unsuitably or neglects or refuses to remove materials or to correct Defective Work.

d. Discontinues the prosecution of the Work, or

e. Fails to resume Work which has been discontinued within a reasonable time after notice to do so, or

f. Becomes insolvent or is declared bankrupt, or commits any act of bankruptcy or insolvency except as prohibited by 11 U.S.C. 363e, or

g. Allows any final judgment to stand against him unsatisfied for period of 60 days, or

h. Makes an assignment for the benefit of creditors without the consent of the Contracting Officer, or

i. Disregards Regulatory Requirements, or

j. Otherwise violates in any substantial way any provisions of the Contract Documents, or

k. For any cause whatsoever, fails to carry on the Work in an acceptable manner, the Contracting Officer may give notice in writing to the CONTRACTOR and his Surety of such delay, neglect, or default.

If the CONTRACTOR or Surety, within the time specified in the above Notice of Default, shall not proceed in accordance therewith, then the CITY may, upon written notification from the Contracting Officer of the fact of such delay, neglect or default and the CONTRACTOR's failure to comply with such notice, have full power and authority without violating the Contract, to take the prosecution of the Work out of the hands of the CONTRACTOR. The CITY may terminate the services of the CONTRACTOR, exclude the CONTRACTOR from the site and take possession of the Work and of all the CONTRACTOR's tools, appliances, construction equipment and machinery at the site and use the same to the full extent they could be used by the CONTRACTOR (without liability to the CONTRACTOR for trespass or conversion), incorporate in the Work all materials and equipment stored at the site or for which the CITY has paid the CONTRACTOR but which are stored elsewhere, and finish the Work as the CITY may deem expedient. The CITY may enter into an agreement for the completion of said Contract according to the terms and provisions thereof, or use such other methods that in the opinion of the Contracting Officer are required for the completion of said Contract in an acceptable manner.

14.2.3 The Contracting Officer may, by written notice to the CONTRACTOR and his Surety or his representative, transfer the employment of the Work from the CONTRACTOR to the Surety, or if the CONTRACTOR abandons the Work undertaken under the Contract, the Contracting Officer may, at his option with written notice to the Surety and without any written notice to the CONTRACTOR, transfer the employment for said Work directly to the Surety. The Surety shall submit its plan for completion of the Work, including any contracts or agreements with third parties for such completion, to the CITY for approval prior to beginning completion of the Work. Approval of such contracts shall be in accordance with all applicable requirements and procedures for approval of subcontracts as stated in the Contract Documents.

14.2.4 Upon receipt of the notice terminating the services of the CONTRACTOR, the Surety shall enter upon the premises and take possession of all materials, tools, and appliances thereon for the purpose of completing the Work included under the Contract and employ by contract or otherwise any person or persons to finish the Work and provide the materials therefor, without termination of the continuing full force and effect of this Contract. In case of such transfer of employment to the Surety, the Surety shall be paid in its own name on estimates covering Work subsequently performed under the terms of the Contract and according to the terms thereof without any right of the CONTRACTOR to make any claim for the same or any part thereof.

14.2.5 If the Contract is terminated for default, the CONTRACTOR and the Surety shall be jointly and severally liable for damages for delay as provided by Article 11.8, and for the excess cost of completion, and all costs and expenses incurred by the CITY in completing the Work or arranging for completion of the Work, including but not limited to costs of assessing the Work to be done, costs associated with advertising, soliciting or negotiating for bids or proposals for completion, and other reprocurement costs. Following termination the CONTRACTOR shall not be entitled to receive any further balance of the amount to be paid under the contract until the work is fully finished and accepted, at which time if the unpaid balance exceeds the amount due the CITY and any amounts due to persons for whose benefit the CITY has withheld funds, such excess shall be paid by the CITY to the CONTRACTOR. If the damages, costs, and expenses due the CITY exceed the unpaid balance, the CONTRACTOR and his Surety shall pay the difference.

14.2.6 If, after notice of termination of the CONTRACTOR's right to proceed under the provisions of this clause, it is determined for any reason that the CONTRACTOR was not in default under the provisions of this clause, or that the delay was excusable under the provisions of this clause, or that termination was wrongful, the rights and obligations of the parties shall be determined in accordance with the clause providing for convenience termination.

14.3 Rights or Remedies:

Where the CONTRACTOR's services have been so terminated by the CITY, the termination will not affect any rights or remedies of the CITY against the CONTRACTOR then existing or which may thereafter accrue. Any retention or payment of moneys due the CONTRACTOR by the CITY will not release the CONTRACTOR from liability.

14.4 Convenience Termination:

14.4.1 The performance of the Work may be terminated by the CITY in accordance with this section in whole or in part, whenever, for any reason the Contracting Officer shall determine that such termination is in the best interest of the CITY. Any such termination shall be effected by delivery to the CONTRACTOR of a Notice of Termination, specifying termination is for the convenience of the CITY the extent to which performance of Work is terminated, and the date upon which such termination becomes effective. Immediately upon receipt of a Notice of Termination and except as otherwise directed by the Contracting Officer the CONTRACTOR shall:

a. Stop Work on the date and to the extent specified in the Notice of Termination;

b. Place no further orders or subcontracts for materials, services, or facilities except as may be necessary for completion of such portion of the Work as is not terminated;

c. Terminate all orders and subcontracts to the extent that they relate to the performance of Work terminated by the Notice of Termination;

d. With the written approval of the Contracting Officer, to the extent he may require, settle all outstanding liabilities and all claims arising out of such termination of orders and subcontracts, the cost of which would be reimbursable, in whole, or in part, in accordance with the provisions of the Contract;

e. Submit to the Contracting Officer a list, certified as to quantity and quality, of any or all items of termination inventory exclusive of items the disposition of which had been directed or authorized by the Contracting Officer;

f. Transfer to the Contracting Officer the completed or partially completed record drawings, Shop Drawings, information, and other property which, if the Contract had been completed, would be required to be furnished to the CITY;

g. Take such action as may be necessary, or as the Contracting Officer may direct, for the protection and preservation of the property related to the Contract which is in the possession of the CONTRACTOR and in which the CITY has or may acquire any interest. The CONTRACTOR shall proceed immediately with the performance of the above obligations.

14.4.2 When the CITY orders termination of the Work effective on a certain date, all Work in place as of that date will be paid for in accordance with the Basis of Payment clause of the Contract. Materials required for completion and on hand but not incorporated in the Work will be paid for at cost plus 15% with materials becoming the property of the CITY - or the CONTRACTOR may retain title to the materials and be paid an agreed upon lump sum. Materials on order shall be canceled, and the CITY shall pay reasonable factory cancellation charges with the option of taking delivery of the materials in lieu of payment of cancellation charges. The CONTRACTOR shall be paid 10% of the cost, freight not included, of materials canceled, and direct expenses only for CONTRACTOR chartered freight transport which cannot be canceled without charges, to the extent that the CONTRACTOR can establish them. The extra costs due to cancellation of Bonds and insurance and that part of job start-up and phase-out costs not amortized by the amount of Work accomplished shall be paid by the CITY. Charges for loss of profit or consequential damages shall not be recoverable except as provided above.

14.4.3 The termination claim shall be submitted promptly, but in no event later than 90 days from the effective date of termination, unless one or more extensions in writing are granted by the Contracting Officer upon request of the CONTRACTOR made in writing within the 90-day period. Upon failure of the CONTRACTOR to submit his termination claim within the time allowed, the Contracting Officer may determine, on the basis of

information available to him, the amount, if any, due to the CONTRACTOR by reason of the termination and shall thereupon pay to the CONTRACTOR so determined.

14.4.4 The CONTRACTOR and the Contracting Officer may agree upon whole or any part of the amount or amounts to be paid to the CONTRACTOR by reason of the total or partial termination of the Work pursuant to this section. The Contract shall be amended accordingly, and the CONTRACTOR shall be paid the agreed amount. In the event of the failure of the CONTRACTOR and the Contracting Officer to agree in whole or in part, as provided heretofore, as to the amounts with respect to costs to be paid to the CONTRACTOR in connection with the termination of the Work the Contracting Officer shall determine, on the basis of information available to him, the amount, if any, due to the CONTRACTOR by reason of the termination and shall pay to the CONTRACTOR the amount determined as follows:

a. All costs and expenses reimbursable in accordance with the Contract not previously paid to the CONTRACTOR for the performance of the Work prior to the effective date of the Notice of Termination;

b. So far as not included under "a" above, the cost of settling and paying claims arising out of the termination of the Work under subcontracts or orders which are properly chargeable to the terminated portions of the Contract;

c. The reasonable costs of settlement with respect to the terminated portion of the Contract heretofore, to the extent that these costs have not been covered under the payment provisions of the Contract.

14.4.5 The CONTRACTOR shall have the right of appeal under the CITY's claim procedures, as defined in Article 15, for any determination made by the Contracting Officer, except if the CONTRACTOR has failed to submit his claim within the time provided and has failed to request extension of such time, CONTRACTOR shall have no such right of appeal. In arriving at the amount due the CONTRACTOR under this section, there shall be deducted:

a. All previous payments made to the CONTRACTOR for the performance of Work under the Contract prior to termination;

b. Any claim which the CITY may have against the CONTRACTOR;

c. The agreed price for, or the proceeds of sale of, any materials, supplies, or other things acquired by the CONTRACTOR or sold pursuant to the provisions of this section and not otherwise recovered by or credited to the CITY; and,

d. All progress payments made to the CONTRACTOR under the provisions of this section.

14.4.6 Where the Work has been terminated by the CITY said termination shall not affect or terminate any of the rights of the CITY against the CONTRACTOR or his Surety then existing or which may thereafter accrue because of such default. Any retention or payment of monies by the CITY due to the CONTRACTOR under the terms of the Contract shall not release the CONTRACTOR or his Surety from liability. Unless otherwise provided for in the Contract Documents, or by applicable statute, the CONTRACTOR, from the effective date of termination and for a period of three years after final settlement under this Contract, shall preserve and make available to the CITY at all reasonable times at the office of the CONTRACTOR, all its books, records, documents, and other evidence bearing on the cost and expenses of the CONTRACTOR under his Contract and relating to the Work terminated hereunder.

ARTICLE 15 - CLAIMS AND DISPUTES

15.1 Notification:

In addition to the notice requirements set out elsewhere in this Contract, if the CONTRACTOR becomes aware of any act or occurrence which may form the basis of a claim by the CONTRACTOR for additional compensation or an extension of time for performance, or if any dispute arises regarding a question of fact or interpretation of the contract, the CONTRACTOR shall immediately inform the Project Manager. If the matter cannot be resolved by agreement within 7 days, the CONTRACTOR shall, within the next 14 days, submit an Intent to Claim in writing to the Project Manager. The

Claim, if not resolved, shall be presented to the Project Manager, in writing, within 60 days following receipt of the Intent to Claim. Receipt of the Claim will be acknowledged in writing by the Project Manager. The CONTRACTOR agrees that unless these written notices are provided, the CONTRACTOR will have no entitlement to additional time or compensation for such act, event or condition. The CONTRACTOR shall in any case continue diligent performance of the Contract.

15.2 Presenting Claim:

The Claim shall specifically include the following:

15.2.1 The act, event or condition giving rise to the claim.
15.2.2 The Contract provisions which apply to the claim and under which relief is provided.
15.2.3 The item or items of Contract Work affected and how they are affected.
15.2.4 The specific relief requested, including contract time if applicable, and the basis upon which it was calculated.

15.3 Claim Validity, Additional Information, and Project Manager's Actions:

The Claim, in order to be valid, must not only show that the CONTRACTOR suffered damages or delay but that those conditions were actually a result of the act, event or condition complained of and that the Contract provides entitlement to relief to the CONTRACTOR for such act, event, or condition. The Project Manager reserves the right to make written request to the CONTRACTOR at any time for additional information which the CONTRACTOR may possess relative to the Claim. The CONTRACTOR agrees to provide the Project Manager such additional information within 30 days of receipt of such a request. Failure to furnish such additional information may be regarded as a waiver of the Claim. The Claim, if not resolved by agreement within 60 days of its receipt, will automatically be forwarded to the Contracting Officer for formal written decision.

15.4 Contracting Officer's Decision:

The CONTRACTOR will be furnished the Contracting Officer's Decision within the next 90 days, unless additional information is requested by the Contracting Officer. The Contracting Officer's Decision is final and conclusive unless fraudulent as to the Claim.

15.5 Notice of Appeal:

Within 30 days of receipt of the Decision, the CONTRACTOR may deliver a Notice of Appeal to the City Manager of Unalaska, Alaska. The Notice of Appeal shall include specific exceptions to the Contracting Officer's Decision, including specific provisions of the contract, which the CONTRACTOR intends to rely upon in the appeal. General assertions that the Contracting Officer's decision is contrary to law or fact are not sufficient.

15.6 City Manager's Decision:

The decision of the City Manager will be rendered within 120 days of Notice of Appeal. This decision constitutes the exhaustion of contractual and administrative remedies. The time limits given above may only be extended by mutual consent. The decision of the City Manager shall be final and conclusive unless the CONTRACTOR commences action through the court within 120 days from receipt thereof.

Section 00800
SUPPLEMENTARY CONDITIONS

REFERENCE: 1. "GENERAL CONDITIONS OF THE CONTRACT", constitutes the General Conditions of this Contract and is further revised and supplemented by the provisions of these Supplementary Conditions to the Contract, hereinafter called the "Supplementary Conditions." The General Conditions and the Supplementary Conditions are applicable to all of the Work under this Contract and shall apply to the Contractor and all Subcontractors.

The following supplements modify, change, delete, or add to the General Conditions. Where any article of the General Conditions is modified or any paragraph deleted, subparagraph or clause thereof is modified, or deleted by these supplements, the unaltered provisions of such article, paragraph, subparagraph or clause shall remain in effect.

SC-1 ARTICLE 1 - DEFINITIONS, Add the following:

OWNER - The OWNER and CONTRACTING OFFICER are further defined as:

City of Unalaska
Department of Public Works
P.O. Box 610
Unalaska, Alaska 99685-0610
Tel. (907) 581-1260
FAX (907) 581-2187
Attn: Contracting Officer - Director of Public Works

OWNER'S REPRESENTATIVE - The OWNER'S REPRESENTATIVE, CONSULTANT OR ENGINEER is further defined as:

Larsen Consulting Group, Inc.
3710 Woodland Dr. Ste 2100
Anchorage, AK 99517
Tel. (907) 245-8827
Attn: Dale McCoy, PE
Email: dale@lcgak.com

SC-2 ARTICLE 4 - LANDS AND PHYSICAL CONDITIONS

4.3 Soils were investigated as part of this project on three different occasions. Information from those subsurface explorations, borings, testholes and other preliminary investigations appears in Part 7 of these bidding documents. The Bidder shall make his own deductions and conclusions as to the difficulties of making and maintaining the required excavations, the difficulties that may arise from the subsurface conditions, and any other work affected by the subsurface conditions, and shall accept full responsibility thereof.

4.8 Access; add the following:

The Contractor shall be responsible for their own transportation including any needed snow removal on Pyramid Road if contractor access to the site is needed during periods where Pyramid Road is obstructed by snow.

SC-3 ARTICLE 11 - CONTRACT TIME; COMPUTATION AND CHANGE

11.2 Starting the Work; Change the second sentence to read as follows:

"Contractor shall notify the Contracting Officer at least fourteen (14) days in advance of the time actual construction operations will begin."

SC-4 ARTICLE 6 – CONTRACTOR'S RESPONSIBILITIES

6.17 Safety and Protection; add the following:

6.17.4 The Contractor shall do whatever work is necessary for overall project safety and be solely and completely responsible for conditions of the job site, including safety of all persons (including employees) and property during the Contract period. This requirement shall apply continuously and not limited to normal working hours.

Safety provisions shall conform to Federal and State Departments of Labor Occupational Safety and Health Act (OSHA), and other applicable federal, state, county, and local laws, ordinances, codes, requirements set forth herein, and regulations that may be specified in other parts of these Contract Documents. Where these are in conflict, the more stringent requirements shall apply. Contractor shall become thoroughly familiar with governing safety provisions and shall comply with the obligations set forth therein.

The Contractor shall develop and maintain for the duration of the Contract, a safety program that will effectively incorporate and implement required safety provisions. Contractor shall appoint a qualified employee who is authorized to supervise and enforce compliance with the safety program.

The Engineer's duty to conduct construction review of the Contractor's performance does not include a review or approval of the adequacy of Contractor's safety supervisor, safety program, or safety measures taken in, on, or near the construction site.

As part of safety program, Contractor shall maintain at its office or other well-known location at the job site, safety equipment applicable to the Work as prescribed by governing safety authorities, and articles necessary for giving first aid to the injured. Establish procedures for the immediate removal to a hospital or a doctor's care of persons who may be injured on the job site.

Contractor shall do all work necessary to protect the general public from hazards, including but not limited to, surface irregularities, trenches, excavations, and blasting. Barricades, lanterns, and proper signs shall be furnished in sufficient amount to safeguard the public and the work. Construct and maintain satisfactory and substantial fencing, railings, barricades, or steel plates, as applicable, at all openings, obstructions, or other hazards. Such barricades shall have adequate warning lights as necessary or required for safety.

SC-6 ARTICLE 7 – LAWS AND REGULATIONS

Add the following:

7.19 A part of this project is funded with a U.S. ENVIRONMENTAL PROTECTION AGENCY Grant. The City of Unalaska is defined as the grant recipient. The Contractor is defined as the sub-recipient, who is accountable to the recipient for the use of Federal Funds as provided by this Contract. This Contract is considered a Subaward to the City's Grant. As such, the Contractor is required to adhere to the requirements of the USEPA "Administrative Conditions". These requirements are included in Appendix A of these project documents and hereby are incorporated into and become a part of this Contract.

The Contractor shall provide certifications, reports, reporting information, and other information as required and necessary to comply with the Administrative Conditions.

The Contractor supply a Data Universal Numbering System (DUNS) number to the Owner prior to Contract Award.

The Contractor agrees to comply with DBE and WBE requirements as required.

7.20 A part of this project is funded with a loan from the ALASKA CLEAN WATER FUND & ALASKA DRINKING WATER. The Contractor is required to adhere to all requirements of the Loan.

SC-7 ARTICLE 13 – PAYMENTS TO CONTRACTOR AND COMPLETION

Item 13.14 Final Payment and Final Completion; add the following:

13.14.4 The Contractor shall furnish the attached forms fully executed prior to the City making final payment. These forms include the Affidavit of Release of Liens by the Contractor; Lien Release Form; and the Lien Release General to City. The forms will be made available to the contractor in electronic format near the end of the project.

SC-8 ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

Item 3.2 Copies of Contract Documents; replace entire text with the following:

"The City shall furnish to the contractor up to two copies of the Contract Documents. Additional copies will be furnished, upon request, at the cost of reproduction."

AFFIDAVIT OF RELEASE OF LIENS BY THE CONTRACTOR

TO ALL WHOM IT MAY CONCERN:

WHEREAS, the undersigned has been employed by City of Unalaska to furnish labor and materials under a contract dated _____ for the _____, in the Unalaska, Alaska of which the City of Unalaska is the Owner.

NOW, THEREFORE, this _____ day of _____, 201__, the undersigned, as the Contractor for the above-named Contract pursuant to the Conditions of the Contract, hereby certifies that to the best of his knowledge, information and behalf, except as listed below, the Releases or Waivers of Lien* attached hereto include the Contractor, all subcontractors, all suppliers of materials and equipment, and all performers of work, labor or services, who have or may have liens against any property of the Owner and on the monies or other considerations due or to become due from the Owner arising in any manner out of the performance of the Contract referenced above.

EXCEPTIONS: (If none, write "None." If required by the Owner, the Contractor shall furnish bond satisfactory to the Owner for each Exception.) _____.

ATTACHMENTS:

1. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment.

2. Separate Release or Waiver of Liens from Subcontractors and material and equipment suppliers.

_____

Contractor (Name of sole ownership corporation or partnership)

_____

(Signature of Authorized Representative)

_____

Title

* The word lien as used herein shall include Stop Orders, Stop Notices, or Freeze Orders on the monies other consideration of the Owner that are due or to become due on the Contract referenced above.

[INSERT GENERAL CONTRACTOR NAME].
("Contractor")

Unconditional Waiver and Release of Lien/Claim for Subcontractor Upon Final Payment

Project Name and Location:

_____
_____
Project # _____

_____
Unalaska, Alaska

Company Name:

[INSERT SUB NAME]

("Payee")

AMOUNT OF PAYMENT: _____

WHEREAS,

_____, being first duly sworn, states that he is [INSERT TITLE]___ of Payee which has a contract with **Contractor** on the above-referenced project.

NOW, THEREFORE, in **FINAL PAYMENT**, the undersigned, for and in consideration of the amount of payment identified above received or to be received and other good and valuable consideration , the receipt of which is hereby acknowledged, does hereby waive and release any and all liens or right of liens or claims on the aforementioned property and all improvements thereon, and on monies or other consideration due or to become due on account of labor or services, materials, fixtures, or apparatus heretofore furnished, or which may be furnished at anytime hereafter, and do hereby further release and forever discharge the City of Unalaska and Contractor, and any payment and performance bond surety, of and from all manner of debts, claims, demands or other sums due or claimed to be due or owed on account of the above-referenced project and/or the above-referenced contract.

THIS WAIVER AND RELEASE IS UNCONDITIONAL, save and except only the receipt of payment and final bank clearance of said remittance in the above-stated amount.

THE UNDERSIGNED further warrant that; 1) no other sums are claimed, 2) that all laborers, subcontractors, and suppliers employed by Payee. have been paid all sums previously due, and will be paid all current sums due out of this payment, 3) that none of such laborers, subcontractors or suppliers is or will be entitled to claim or assert any claim against the above-described real estate or the improvements thereon for labor or materials

furnished to or for the account of Contractor; 4) there are no federal, state or municipal taxes or other charges unpaid or delinquent.

EXCEPT as set forth below:

EXCEPTIONS:

Person	Amount
_____	_____
_____	_____
_____	_____

Upon request, Payee shall list the names of each of its subcontractors and suppliers, with contract and payment status, and furnish waivers from said parties.

THE PERSONS SIGNING below, by signing, do hereby certify that he/she is fully authorized and empowered to execute this instrument and to bind the Company hereto.

DATED: _____ _____

By:

_____

_____

_____

DATED: _____ _____

By:

_____

_____

STATE OF ALASKA)
) ss.
THIRD JUDICIAL DISTRICT)

THIS IS TO CERTIFY that on this ____ day of _____, 201_, before me appeared _____, who acknowledged being the _____, an Alaska corporation, and voluntarily signing and sealing the foregoing instrument on behalf of said Corporation, and being authorized so to do.

_____
Notary Public in and for Alaska
My Commission Expires:_____

STATE OF ALASKA)
) ss.
THIRD JUDICIAL DISTRICT)

SUBSCRIBED AND SWORN to before me this __ day of _____, 201_.

_____
Notary Public For Alaska
My Commission Expires:

_____

CITY OF UNALASKA

Receipt and Waiver and Release of
Claim for Contractor Upon Final Payment

Project Name and Location:

_____

_____

Unalaska, Alaska

Company Name:

[**INSERT CONTRACTOR NAME]**
"CONTRACTOR"

PAYMENT AMOUNT: _____

WHEREAS, _____, being first duly sworn, states that he is [INSERT TITLE] of CONTRACTOR, general contractor to the City of Unalaska for the above-referenced project.

NOW, THEREFORE, in **FINAL PAYMENT**, the undersigned, for and in consideration of the PAYMENT AMOUNT identified above and other good and valuable consideration paid or to be paid to CONTRACTOR, the receipt of which is hereby acknowledged, CONTRACTOR does hereby waive and release any and all liens or right of liens or claims on the aforementioned property and all improvements thereon, and on monies or other consideration due or to become due on account of labor or services, materials, fixtures, or apparatus heretofore furnished, or which may be furnished at any time hereafter, and does hereby further release and forever discharge the City of Unalaska of and from all manner of debts, claims, demands or other sums due or claimed to be due or owed on account of the above-referenced project and/or the above-referenced contract.

THIS WAIVER AND RELEASE IS UNCONDITIONAL, save and except only; 1) the receipt of payment and final bank clearance of said remittance in the above-stated amount; and 2) the Exceptions identified below or in the Contractor's affidavit attached hereto.

EXCEPTIONS:

Person	Amount
_____	_____
_____	_____

THE UNDERSIGNED further warrants that; 1) no other sums are claimed, 2) that all laborers, subcontractors, and suppliers employed by Contractor have been paid all sums previously due, and will be paid all current sums due out of this payment, 3) that none of such laborers, subcontractors or suppliers is or will be entitled to claim or assert any claim against the above-described real estate or the improvements thereon or any surety bond related to the Project for labor or materials furnished to or for the account of Contractor; and 4) there are no federal, state or municipal taxes or other charges unpaid or delinquent.

THIS WAIVER AND RELEASE IS UNCONDITIONAL, save and except only the receipt of payment and final bank clearance of said remittance in the above-stated amount

THE PERSONS SIGNING below, by signing, do hereby certify that he/she is fully authorized and empowered to execute this instrument and to bind Contractor hereto.

CONTRACTOR.

DATED: _____ BY: _____

_____, [insert title]

STATE OF ALASKA)

) ss.

THIRD JUDICIAL DISTRICT)

THIS IS TO CERTIFY that on this ____ day of _____, 201_, before me appeared _____, who acknowledged to me that he was the _____ of _____, and he acknowledged to me that he had, in his official capacity aforesaid, executed the foregoing documents as the free act and deed of said Corporation, for the uses stated therein.

_____

Notary Public in and for Alaska

My Commission Expires:_____

Part 4

MINIMUM RATES OF PAY

>

General Decision Number: AK130001 11/22/2013 AK1

Superseded General Decision Number: AK20120001

State: Alaska

Construction Types: Building and Heavy

Counties: Alaska Statewide.

BUILDING AND HEAVY CONSTRUCTION PROJECTS (does not include residential construction consisting of single family homes and apartments up to and including 4 stories)

Modification Number	Publication Date
0	01/04/2013
1	02/15/2013
2	03/08/2013
3	03/22/2013
4	04/19/2013
5	05/03/2013
6	05/17/2013
7	06/07/2013
8	07/19/2013
9	08/02/2013
10	08/23/2013
11	09/13/2013
12	09/27/2013
13	10/11/2013
14	11/08/2013
15	11/22/2013

ASBE0097-001 09/02/2013

	Rates	Fringes
Asbestos Workers/Insulator (includes application of all insulating materials protective coverings, coatings and finishings to all types of mechanical systems)	$ 34.88	18.67

ASBE0097-002 09/02/2013

	Rates	Fringes
HAZARDOUS MATERIAL HANDLER (includes preparation, wetting, stripping, removal scrapping, vacuming, bagging, and disposing of all insulation materials, whether they contain asbestos or not, from mechanical systems)	$ 34.88	18.67

BOIL0502-002 01/01/2013

	Rates	Fringes
BOILERMAKER	$ 42.97	26.60

BRAK0001-002 07/01/2013

	Rates	Fringes
Bricklayer, Blocklayer, Stonemason, Marble Mason, Tile Setter, Terrazzo Worker	$ 39.03	18.86
Tile & Terrazzo Finisher	$ 33.27	18.86

CARP1501-001 09/01/2013

	Rates	Fringes
MILLWRIGHT	$ 34.99	20.54

CARP2520-003 09/01/2013

	Rates	Fringes
Diver		
Stand-by	$ 40.90	22.59
Tender	$ 39.90	22.59
Working	$ 80.70	22.59
Piledriver		
Carpenter	$ 36.59	22.59
Piledriver; Skiff Operator and Rigger	$ 36.59	22.59
Sheet Stabber	$ 36.59	22.59
Welder	$ 42.15	22.59

DEPTH PAY PREMIUM FOR DIVERS BELOW WATER SURFACE:

50-100 feet	$1.00 per foot
101 feet and deeper	$2.00 per foot

ENCLOSURE PAY PREMIUM WITH NO VERTICAL ASCENT:

5-50 FEET	$1.00 PER FOOT/DAY
51-100 FEET	$2.00 PER FOOT/DAY
101 FEET AND ABOVE	$3.00 PER FOOT/DAY

SATURATION DIVING:
The standby rate applies until saturation starts. The saturation diving rate applies when divers are under pressure continuously until work task and decompression are complete. the diver rate shall be paid for all saturation hours.

WORK IN COMBINATION OF CLASSIFICATIONS:
Employees working in any combination of classifications within the diving crew (except dive supervisor) in a shift are paid in the classification with the highest rate for that shift.

CARP4059-001 09/01/2013

	Rates	Fringes
CARPENTER		
Carpenter	$ 36.59	22.59
Lather/Drywall Applicator	$ 36.59	22.59

ELEC1547-004 04/01/2013

	Rates	Fringes
CABLE SPLICER	$ 39.87	3%+$22.93
Electrician;Technician	$ 38.12	3%+$22.93

ELEC1547-005 04/01/2013

Line Construction

	Rates	Fringes
CABLE SPLICER	$ 50.52	3%+25.68
Linemen (Including Equipment Operators, Technician)	$ 48.77	3%+25.68
Powderman	$ 46.77	3%+25.68
TREE TRIMMER	$ 34.12	3%+19.48

ELEV0019-002 01/01/2013

	Rates	Fringes
ELEVATOR MECHANIC	$ 49.575	25.185+a+b

FOOTNOTE: a. Employer contributes 8% of the basic hourly rate for over 5 year's service and 6% of the basic hourly rate for 6 months to 5 years' of service as vacation paid credit. b. Eight paid holidays: New Year's Day; Memorial Day; Independence Day; Labor Day; Veteran's Day; Thanksgiving Day; Friday after Thanksgiving and Christmas Day

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ENGI0302-002 01/01/2013

	Rates	Fringes
Power equipment operators:		
GROUP 1	$ 38.28	19.85
GROUP 1A	$ 40.04	19.85
GROUP 2	$ 37.51	19.85
GROUP 3	$ 36.79	19.85
GROUP 4	$ 30.58	19.85
TUNNEL WORK		
GROUP 1	$ 42.11	19.85
GROUP 1A	$ 44.04	19.85
GROUP 2	$ 41.26	19.85
GROUP 3	$ 40.47	19.85
GROUP 4	$ 33.64	19.85

POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP 1: Asphalt Roller: Breakdown, Intermediate, and Finish; Back Filler; Barrier Machine (Zipper); Beltcrete with power pack and similar conveyors; Bending Machine; Boat Coxwains; Bulldozers; Cableways, Highlines and Cablecars; Cleaning Machine; Coating Machine; Concrete Hydro Blaster; Cranes-45 tons and under or 150 foot boom and under (including jib and attachments): (a) Hydralifts or Transporters, all track or truck type,(b) Derricks; Crushers; Deck Winches-Double Drum; Ditching or Trenching Machine (16 inch or over); Drilling Machines, core, cable, rotary and exploration; Finishing Machine Operator, Concrete Paving, Laser Screed, Sidewalk, Curb and Gutter Machine; Helicopters; Hover Craft, Flex Craft, Loadmaster, Air Cushion, All Terrain Vehicle, Rollagon, Bargecable, Nodwell, and Snow Cat; Hydro Ax: Feller Buncher and similar; Loaders (2 1/2 yards through 5 yards, including all attachments): Forklifts with telescopic boom and swing attachment, Overhead and front end, 2 1/2 yards through 5 yards, Loaders with forks or pipe clamps; Loaders, elevating belt type, Euclid and similar types; Mechanics, Bodyman; Micro Tunneling Machine; Mixers: Mobile type w/hoist combination; Motor Patrol Grader; Mucking Machines: Mole, Tunnel Drill, Horizontal/Directional Drill Operator, and/or Shield; Operator on Dredges; Piledriver Engineers, L. B. Foster, Puller or similar Paving Breaker; Power Plant, Turbine Operator, 200 k.w. and over (power plants or combination of power units over 300 k.w.); Scrapers-through 40 yards; Service Oiler/Service Engineer; Sidebooms-under 45 tons; Shot Blast Machine; Shovels, Backhoes, Excavators with all attachments, and Gradealls (3 yards and under), Spreaders, Blaw Knox, Cedarapids, Barber Greene, Slurry Machine; Sub-grader (Gurries, Reclaimer, and similar types); Tack tractor; Truck mounted Concrete Pumps, Conveyor, Creter; Water Kote Machine; Unlicensed off road hauler

GROUP 1A: Camera/Tool/Video Operator (Slipline), Cranes-over 45 tons or 150 foot (including jib and attachments): (a) Clamshells and Draglines (over 3 yards), (b) Tower cranes; Licensed Water/Waste Water Treatment Operator; Loaders over 5 yds.; Certified Welder, Electrical Mechanic, Camp Maintenance Engineer, Mechanic (over 10,000 hours); Motor Patrol Grader, Dozer, Grade Tractor, Roto-mill/Profiler (finish: when finishing to final grade and/or to hubs, or for asphalt); Power Plants: 1000 k.w. and over; Quad; Screed; Shovels, Backhoes, Excavators with all attachments (over 3 yards), Sidebooms over 45 tons; Slip Form Paver, C.M.I. and similar types; Scrapers over 40 yards;

GROUP 2: Boiler-fireman; Cement Hog and Concrete Pump Operator; Conveyors (except as listed in group 1); Hoist on steel erection; Towermobiles and Air Tuggers; Horizontal/Directional Drill Locator;Licensed Grade Technician; Loaders, (i.e., Elevating Grader and Material Transfer Vehicle); Locomotives: rod and geared engines; Mixers; Screening, Washing Plant; Sideboom (cradling rock drill regardless of size); Skidder; Trencing Machine under 16 inches; Waste/ Waste Water Treatment Operator.

GROUP 3: "A" Frame Trucks, Deck Winches: single power drum; Bombardier (tack or tow rig); Boring Machine; Brooms-power; Bump Cutter; Compressor; Farm tractor; Forklift, industrial type; Gin Truck or Winch Truck with poles when used for hoisting; Grade Checker and Stake Hopper; Hoist, Air Tuggers, Elevators; Loaders: (a) Elevating-Athey, Barber Green and similar types (b) Forklifts or Lumber Carrier (on construction job site) (c) Forklifts with Tower (d) Overhead and Front-end, under 2 1/2 yds. Locomotives:Dinkey (air, steam, gas and electric) Speeders; Mechanics (light duty); Oil, Blower Distribution; Post Hole Diggers, mechanical; Pot Fireman (power agitated); Power Plant, Turbine Operator, under 200 k.w.; Pumps-water; Roller-other than Plantmix; Saws, concrete; Skid Steer with all attachments; Straightening Machine; Tow Tractor

GROUP 4: Rig Oiler/Crane Assistant Engineer;Parts and Equipment Coordinator; Swamper (on trenching machines or shovel type equipment); Spotter; Steam Cleaner; Drill Helper.

FOOTNOTE: Groups 1-4 receive 10% premium while performing tunnel or underground work. Rig Oiler/Crane Assistant Engineer shall be required on cranes over 85 tons or over 100 feet of boom.

IRON0751-003 08/01/2013

	Rates	Fringes
Ironworkers:		
BRIDGE, STRUCTURAL, ORNAMENTAL, REINFORCING MACHINERY MOVER, RIGGER, SHEETER, STAGE RIGGER, BENDER OPERATOR	$ 33.55	25.53
FENCE, BARRIER AND GUARDRAIL INSTALLERS	$ 30.05	25.53
GUARDRAIL LAYOUT MAN	$ 30.79	25.53
HELICOPTER, TOWER	$ 34.55	25.53

LABO0341-005 07/01/2013

	Rates	Fringes
Laborers: South of the 63rd Parallel & West of Longitude 138 Degrees		
GROUP 1	$ 29.25	22.32
GROUP 2	$ 30.25	22.32
GROUP 3	$ 31.15	22.32
GROUP 3A	$ 34.43	22.32
GROUP 3B	$ 35.26	22.32
GROUP 4	$ 18.82	22.32
TUNNELS, SHAFTS, AND RAISES		
GROUP 1	$ 32.18	22.32
GROUP 2	$ 33.28	22.32
GROUP 3	$ 34.27	22.32

GROUP 3A	$ 37.87	22.32
GROUP 3B	$ 38.79	22.32

LABORERS CLASSIFICATIONS

GROUP 1: Asphalt Workers (shovelman, plant crew); Brush Cutters; Camp Maintenance Laborer; Carpenter Tenders; Choke Setters, Hook Tender, Rigger, Signalman; Concrete Laborer(curb and gutter, chute handler, grouting, curing, screeding); Crusher Plant Laborer; Demolition Laborer; Ditch Diggers; Dump Man; Environmental Laborer (asbestos (limited to nonmechanical systems), hazardous and toxic waste, oil spill); Fence Installer; Fire Watch Laborer; Flagman; Form Strippers; General Laborer; Guardrail Laborer, Bridge Rail Installers; Hydro-Seeder Nozzleman; Laborers (building); Landscape or Planter; Laying of Decorative Block (retaining walls, flowered decorative block 4 feet and below); Material Handlers; Pneumatic or Power Tools; Portable or Chemical Toilet Serviceman; Pump Man or Mixer Man; Railroad Track Laborer; Sandblast, Pot Tender; Saw Tenders; Scaffold Building and Erecting; Slurry Work; Stake Hopper; Steam Point or Water Jet Operator; Steam Cleaner Operator; Tank Cleaning; Utiliwalk, Utilidor Laborer and Conduit Installer; Watchman (construction projects); Window Cleaner

GROUP 2: Burning and Cutting Torch; Cement or Lime Dumper or Handler (sack or bulk); Choker Splicer; Chucktender (wagon, airtrack and hydraulic drills); Concrete Laborers (power buggy, concrete saws, pumpcrete nozzleman, vibratorman); Culvert Pipe Laborer; Cured in place Pipelayer; Environmental Laborer (marine work, oil spill skimmer operator, small boat operator); Foam Gun or Foam Machine Operator; Green Cutter (dam work); Gunnite Operator; Hod Carriers; Jackhammer or Pavement Breakers (more than 45 pounds);Laying of Decorative Block (retaining walls, flowered decorative block above 4 feet); Mason Tender and Mud Mixer (sewer work); Pilot Car; Plasterer, Bricklayer and Cement Finisher Tenders; Power Saw Operator; Railroad Switch Layout Laborer; Sandblaster; Sewer Caulkers; Sewer Plant Maintenance Man; Thermal Plastic Applicator; Timber Faller, chain saw operator, filer; Timberman

GROUP 3: Alarm Installer; Bit Grinder; Guardrail Machine Operator; High Rigger and tree topper; High Scaler; Multiplate; Slurry Seal Squeegee Man

GROUP 3A: Asphalt Raker, Asphalt Belly dump lay down; Drill Doctor (in the field); Drillers (including, but not limited to, wagon drills, air track drills; hydraulic drills); Powderman; Pioneer Drilling and Drilling Off Tugger (all type drills); Pipelayers

GROUP 3B: Grade checker (setting or transfering of grade marks, line and grade)

GROUP 4: Final Building Cleanup

TUNNELS, SHAFTS, AND RAISES CLASSIFICATIONS

GROUP 1: Brakeman; Muckers; Nippers; Topman and Bull Gang; Tunnel Track Laborer

GROUP 2: Burning and Cutting Torch; Concrete Laborers; Jackhammers; Nozzleman, Pumpcrete or Shotcrete.

GROUP 3: Miner; Retimberman

GROUP 3A: Asphalt Raker, Asphalt Belly dump lay down; Drill Doctor (in the field); Drillers (including, but not limited to, wagon drills, air track drills; hydraulic drills); Powderman; Pioneer Drilling and Drilling Off Tugger (all type drills); Pipelayers.

GROUP 3B: Grade checker (setting or transfering of grade marks, line and grade)

Tunnel shaft and raise rates only apply to workers regularly employed inside a tunnel portal or shaft collar.

LABO0942-001 07/01/2013

	Rates	Fringes
Laborers: North of the 63rd Parallel & East of Longitude 138 Degrees		
GROUP 1	$ 29.25	22.32
GROUP 2	$ 30.25	22.32
GROUP 3	$ 31.15	22.32
GROUP 3A	$ 34.43	22.32
GROUP 3B	$ 35.26	22.32
GROUP 4	$ 18.82	22.32
TUNNELS, SHAFTS, AND RAISES		
GROUP 1	$ 32.18	22.32
GROUP 2	$ 33.28	22.32
GROUP 3	$ 34.27	22.32
GROUP 3A	$ 37.87	22.32
GROUP 3B	$ 38.79	22.32

LABORERS CLASSIFICATIONS

GROUP 1: Asphalt Workers (shovelman, plant crew); Brush Cutters; Camp Maintenance Laborer; Carpenter Tenders; Choke Setters, Hook Tender, Rigger, Signalman; Concrete Laborer(curb and gutter, chute handler, grouting, curing, screeding); Crusher Plant Laborer; Demolition Laborer; Ditch Diggers; Dump Man; Environmental Laborer (asbestos (limited to nonmechanical systems), hazardous and toxic waste, oil spill); Fence Installer; Fire Watch Laborer; Flagman; Form Strippers; General Laborer; Guardrail Laborer, Bridge Rail Installers; Hydro-Seeder Nozzleman; Laborers (building); Landscape or Planter; Laying of Decorative Block (retaining walls, flowered decorative block 4 feet and below); Material Handlers; Pneumatic or Power Tools; Portable or Chemical Toilet Serviceman; Pump Man or Mixer Man; Railroad Track Laborer; Sandblast, Pot Tender; Saw Tenders; Scaffold Building and Erecting; Slurry Work; Stake Hopper; Steam Point or Water Jet Operator;

Steam Cleaner Operator; Tank Cleaning; Utiliwalk, Utilidor Laborer and Conduit Installer; Watchman (construction projects); Window Cleaner

GROUP 2: Burning and Cutting Torch; Cement or Lime Dumper or Handler (sack or bulk); Choker Splicer; Chucktender (wagon, airtrack and hydraulic drills); Concrete Laborers (power buggy, concrete saws, pumpcrete nozzleman, vibratorman); Culvert Pipe Laborer; Cured in place Pipelayer; Environmental Laborer (marine work, oil spill skimmer operator, small boat operator); Foam Gun or Foam Machine Operator; Green Cutter (dam work); Gunnite Operator; Hod Carriers; Jackhammer or Pavement Breakers (more than 45 pounds);Laying of Decorative Block (retaining walls, flowered decorative block above 4 feet); Mason Tender and Mud Mixer (sewer work); Pilot Car; Plasterer, Bricklayer and Cement Finisher Tenders; Power Saw Operator; Railroad Switch Layout Laborer; Sandblaster; Sewer Caulkers; Sewer Plant Maintenance Man; Thermal Plastic Applicator; Timber Faller, chain saw operator, filer; Timberman

GROUP 3: Alarm Installer; Bit Grinder; Guardrail Machine Operator; High Rigger and tree topper; High Scaler; Multiplate; Slurry Seal Squeegee Man

GROUP 3A: Asphalt Raker, Asphalt Belly dump lay down; Drill Doctor (in the field); Drillers (including, but not limited to, wagon drills, air track drills; hydraulic drills); Powderman; Pioneer Drilling and Drilling Off Tugger (all type drills); Pipelayers

GROUP 3B: Grade checker (setting or transfering of grade marks, line and grade)

GROUP 4: Final Building Cleanup

TUNNELS, SHAFTS, AND RAISES CLASSIFICATIONS

GROUP 1: Brakeman; Muckers; Nippers; Topman and Bull Gang; Tunnel Track Laborer

GROUP 2: Burning and Cutting Torch; Concrete Laborers; Jackhammers; Nozzleman, Pumpcrete or Shotcrete.

GROUP 3: Miner; Retimberman

GROUP 3A: Asphalt Raker, Asphalt Belly dump lay down; Drill Doctor (in the field); Drillers (including, but not limited to, wagon drills, air track drills; hydraulic drills); Powderman; Pioneer Drilling and Drilling Off Tugger (all type drills); Pipelayers.

GROUP 3B: Grade checker (setting or transfering of grade marks, line and grade)

Tunnel shaft and raise rates only apply to workers regularly employed inside a tunnel portal or shaft collar.

PAIN1959-001 03/01/2013

NORTH OF THE 63RD PARALLEL

	Rates	Fringes
PAINTER		
BRUSH/ROLLER PAINT OR WALL COVERER	$ 30.15	19.10
TAPING, TEXTURING, STRUCTURAL PAINTING, SANDBLASTING, POT TENDER, FINISH METAL, SPRAY, BUFFER OPERATOR, RADON MITIGATION, LEAD BASED PAINT ABATEMENT, HAZARDOUS MATERIAL HANDLER	$ 30.67	19.10

PAIN1959-002 03/01/2013

SOUTH OF THE 63RD PARALLEL

	Rates	Fringes
Painters:		
Brush, Roller, Sign, Paper and Vinyl, Swing Stage, Hand Taper/Drywall, Structural Steel, and Commercial Spray	$ 28.39	18.85
Machine Taper/Drywall	$ 29.64	18.85
Spray-Sand/Blast, Epoxy and Tar Applicator	$ 29.74	18.85

PAIN1959-003 01/01/2013

NORTH OF THE 63RD PARALLEL

	Rates	Fringes
GLAZIER	$ 35.76	18.61

PAIN1959-004 07/01/2012

	Rates	Fringes
FLOOR LAYER: Carpet	$ 30.09	13.02

PAIN1959-006 01/01/2013

SOUTH OF THE 63RD PARALLEL

	Rates	Fringes
GLAZIER	$ 35.76	17.86

PLAS0867-001 02/01/2013

	Rates	Fringes
PLASTERER		

North of the 63rd parallel..$ 34.94 19.56
South of the 63rd parallel..$ 34.69 19.56

PLAS0867-004 02/01/2013

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER		
North of the 63rd parallel..	$ 34.69	19.56
South of the 63rd parallel..	$ 34.44	19.56

PLUM0262-002 07/01/2013

East of the 141st Meridian

	Rates	Fringes
Plumber; Steamfitter.....	$ 36.02	25.62

PLUM0367-002 07/01/2013

South of the 63rd Parallel

	Rates	Fringes
Plumber; Steamfitter.....	$ 38.46	20.74

PLUM0375-002 07/01/2013

North of the 63rd Parallel

	Rates	Fringes
Plumber; Steamfitter.....	$ 39.96	20.85

PLUM0669-002 07/01/2013

	Rates	Fringes
SPRINKLER FITTER.....	$ 42.05	21.67

SHEE0023-003 07/01/2012

South of the 63rd Parallel

	Rates	Fringes
Sheet Metal Worker.....	$ 39.49	19.88

SHEE0023-004 07/01/2012

North of the 63rd Parallel

	Rates	Fringes
Sheet Metal Worker.....	$ 44.08	19.59

TEAM0959-003 09/01/2013

	Rates	Fringes

TRUCK DRIVER

GROUP 1	$ 38.89	18.57
GROUP 1A	$ 40.16	18.57
GROUP 2	$ 37.63	18.57
GROUP 3	$ 36.81	18.57
GROUP 4	$ 36.23	18.57
GROUP 5	$ 35.47	18.57

GROUP 1: Semi with Double Box Mixer; Dump Trucks (including rockbuggy and trucks with pups) over 40 yards up to and including 60 yards; Deltas, Commanders, Rollogans and similar equipment when pulling sleds, trailers or similar equipment; Boat Coxswain; Lowboys including attached trailers and jeeps, up to and including 12 axles; Ready-mix over 12 yards up to and including 15 yards); Water Wagon (250 Bbls and above); Tireman, Heavy Duty/Fueler

GROUP 1A: Dump Trucks (including Rockbuggy and Trucks with pups) over 60 yards up to and including 100 yards; Jeeps (driver under load)

GROUP 2: Turn-O-Wagon or DW-10 not self-loading; All Deltas, Commanders, Rollogans, and similar equipment; Mechanics; Dump Trucks (including Rockbuggy and Trucks with pups) over 20 yards up to and including 40 yards; Lowboys including attached trailers and jeeps up to and including 8 axles; Super vac truck/cacasco truck/heat stress truck; Ready-mix over 7 yards up to and including 12 yards; Partsman; Stringing Truck

GROUP 3: Dump Trucks (including Rockbuggy and Trucks with pups) over 10 yards up to and including 20 yards; batch trucks 8 yards and up; Oil distributor drivers; Oil Distributor Drivers; Trucks/Jeeps (push or pull); Traffic Control Technician

GROUP 4: Buggymobile; Semi or Truck and trailer; Dumpster; Tireman (light duty); Dump Trucks (including Rockbuggy and Truck with pups) up to and including 10 yards; Track Truck Equipment; Grease Truck; Flat Beds, dual rear axle; Hyster Operators (handling bulk aggregate); Lumber Carrier; Water Wagon, semi; Water Truck, dual axle; Gin Pole Truck, Winch Truck, Wrecker, Truck Mounted "A" Frame manufactured rating over 5 tons; Bull Lifts and Fork Lifts with Power Boom and Swing attachments, over 5 tons; Front End Loader with Forks; Bus Operator over 30 passengers; All Terrain Vehicles; Boom Truck/Knuckle Truck over 5 tons; Foam Distributor Truck/dual axle; Hydro-seeders, dual axle; Vacuum Trucks, Truck Vacuum Sweepers; Loadmaster (air and water); Air Cushion or similar type vehicle; Fire Truck/Ambulance Driver; Combination Truck-fuel and grease; Compactor (when pulled by rubber tired equipment); Rigger (air/water/oilfield); Ready Mix, up to and including 7 yards;

GROUP 5: Gravel Spreader Box Operator on Truck; Flat Beds, single rear axle; Boom Truck/Knuckle Truck up to and including 5 tons; Pickups (Pilot Cars and all light duty vehicles); Water Wagon (Below 250 Bbls); Gin Pole Truck,

Winch Truck, Wrecker, Truck Mounted "A" Frame, manufactured rating 5 tons and under; Bull Lifts and Fork Lifts (fork lifts with power broom and swing attachments up to and including 5 tons); Buffer Truck; Tack Truck; Farm type Rubber Tired Tractor (when material handling or pulling wagons on a construction project); Foam Distributor, single axle; Hydro-Seeders, single axle; Team Drivers (horses, mules and similar equipment); Fuel Handler (station/bulk attendant); Batch Truck, up to and including 7 yards; Gear/Supply Truck; Bus Operator, Up to 30 Passengers; Rigger/Swamper

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WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is union or non-union.

Union Identifiers

An identifier enclosed in dotted lines beginning with characters other than "SU" denotes that the union classification and rate have found to be prevailing for that classification. Example: PLUM0198-005 07/01/2011. The first four letters , PLUM, indicate the international union and the four-digit number, 0198, that follows indicates the local union number or district council number where applicable , i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2011, following these characters is the effective date of the most current negotiated rate/collective bargaining agreement which would be July 1, 2011 in the above example.

Union prevailing wage rates will be updated to reflect any changes in the collective bargaining agreements governing the rates.

0000/9999: weighted union wage rates will be published annually each January.

Non-Union Identifiers

Classifications listed under an "SU" identifier were derived from survey data by computing average rates and are not union rates; however, the data used in computing these rates may include both union and non-union data. Example: SULA2004-007 5/13/2010. SU indicates the rates are not union majority rates, LA indicates the State of Louisiana; 2004 is the year of the survey; and 007 is an internal number used in producing the wage determination. A 1993 or later date, 5/13/2010, indicates the classifications and rates under that identifier were issued as a General Wage Determination on that date.

Survey wage rates will remain in effect and will not change until a new survey is conducted.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION

Davis–Bacon Requirements

Wage Rate Requirements Under The Consolidated and Further Continuing Appropriations Act, 2013 (P.L. 113-6)

Preamble

With respect to the Clean Water and Safe Drinking Water State Revolving Funds, EPA provides capitalization grants to each State which in turn provides subgrants or loans to eligible entities within the State. Typically, the subrecipients are municipal or other local governmental entities that manage the funds. For these types of recipients, the provisions set forth under Roman Numeral I, below, shall apply. Although EPA and the State remain responsible for ensuring subrecipients' compliance with the wage rate requirements set forth herein, those subrecipients shall have the primary responsibility to maintain payroll records as described in Section 3(ii)(A), below and for compliance as described in Section I-5.

Occasionally, the subrecipient may be a private for profit or not for profit entity. For these types of recipients, the provisions set forth in Roman Numeral II, below, shall apply. Although EPA and the State remain responsible for ensuring subrecipients' compliance with the wage rate requirements set forth herein, those subrecipients shall have the primary responsibility to maintain payroll records as described in Section II-3(ii)(A), below and for compliance as described in Section II-5.

I. Requirements Under The Consolidated and Further Continuing Appropriations Act, 2013 (P.L. 113-6) For Subrecipients That Are Governmental Entities:

The following terms and conditions specify how recipients will assist EPA in meeting its Davis-Bacon (DB) responsibilities when DB applies to EPA awards of financial assistance under the FY 2013 Continuing Resolution with respect to State recipients and subrecipients that are governmental entities. If a subrecipient has questions regarding when DB applies, obtaining the correct DB wage determinations, DB provisions, or compliance monitoring, it may contact the State recipient. If a State recipient needs guidance, the recipient may contact Lorraine Fleury at fleury.lorraine@epa.gov or at 215-814-2341 of EPA, Region III Grants and Audit Management Branch for guidance. The recipient or subrecipient may also obtain additional guidance from DOL's web site at http://www.dol.gov/whd/

1. Applicability of the Davis- Bacon (DB) prevailing wage requirements.

Under the FY 2013 Continuing Resolution, DB prevailing wage requirements apply to the construction, alteration, and repair of treatment works carried out in whole or in part with assistance made available by a State water pollution control revolving fund and to any construction project carried out in whole or in part by assistance made available by a drinking water treatment revolving loan fund. If a subrecipient encounters a unique situation at a site that presents uncertainties regarding DB applicability, the subrecipient must discuss the situation with the recipient State before authorizing work on that site.

2. Obtaining Wage Determinations.

(a) Subrecipients shall obtain the wage determination for the locality in which a covered activity subject to DB will take place prior to issuing requests for bids, proposals, quotes or other methods for soliciting contracts (solicitation) for activities subject to DB. These wage determinations shall be incorporated into solicitations and any subsequent contracts. Prime contracts must contain a provision requiring that subcontractors follow the wage determination incorporated into the prime contract.

(i) While the solicitation remains open, the subrecipient shall monitor www.wdol.gov weekly to ensure that the wage determination contained in the solicitation remains current. The subrecipients shall amend the solicitation if DOL issues a modification more than 10 days prior to the closing date (i.e. bid opening) for the solicitation. If DOL modifies or supersedes the applicable wage determination less than 10 days prior to the closing date, the subrecipients may request a finding from the State recipient that there is not a reasonable time to notify interested contractors of the modification of the wage determination. The State recipient will provide a report of its findings to the subrecipient.

(ii) If the subrecipient does not award the contract within 90 days of the closure of the solicitation, any modifications or supersedes DOL makes to the wage determination contained in the solicitation shall be effective unless the State recipient, at the request of the subrecipient, obtains an extension of the 90 day period from DOL pursuant to 29 CFR 1.6(c)(3)(iv). The subrecipient shall monitor www.wdol.gov on a weekly basis if it does not award the contract within 90 days of closure of the solicitation to ensure that wage determinations contained in the solicitation remain current.

(b) If the subrecipient carries out activity subject to DB by issuing a task order, work assignment or similar instrument to an existing contractor (ordering instrument) rather than by publishing a solicitation, the subrecipient shall insert the appropriate DOL wage determination from www.wdol.gov into the ordering instrument.

(c) Subrecipients shall review all subcontracts subject to DB entered into by prime contractors to verify that the prime contractor has required its subcontractors to include the applicable wage determinations.

(d) As provided in 29 CFR 1.6(f), DOL may issue a revised wage determination applicable to a subrecipient's contract after the award of a contract or the issuance of an ordering instrument if DOL determines that the subrecipient has failed to incorporate a wage determination or has used a wage determination that clearly does not apply to the contract or ordering instrument. If this occurs, the subrecipient shall either terminate the contract or ordering instrument and issue a revised solicitation or ordering instrument or incorporate DOL's wage determination retroactive to the beginning of the contract or ordering instrument by change order. The subrecipient's contractor must be compensated for any increases in wages resulting from the use of DOL's revised wage determination.

3. Contract and Subcontract provisions.

(a) The Recipient shall insure that the subrecipient(s) shall insert in full in any contract in excess of $2,000 which is entered into for the actual construction, alteration and/or repair, including painting and decorating, of a treatment work under the CWSRF or a construction project under the DWSRF financed in whole or in part from Federal funds or in accordance with guarantees of a Federal agency or financed from funds obtained by pledge of any contract of a Federal agency to make a loan, grant or annual contribution (except where a different meaning is expressly indicated), and which is subject to the labor standards provisions of any of the acts listed in § 5.1 or the FY 2013 Continuing Resolution, the following clauses:

(1) Minimum wages.

(i) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in § 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

Subrecipients may obtain wage determinations from the U.S. Department of Labor’s web site, www.dol.gov.

(ii)(A) The subrecipient(s), on behalf of EPA, shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The State award official shall approve a request for an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the subrecipient(s) agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), documentation of the action taken and the request, including the local wage determination shall be sent by the subrecipient (s) to the State award official. The State award official will transmit the request, to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210 and to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative,

will approve, modify, or disapprove every additional classification request within 30 days of receipt and so advise the State award official or will notify the State award official within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the subrecipient(s) do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the award official shall refer the request and the local wage determination, including the views of all interested parties and the recommendation of the State award official, to the Administrator for determination. The request shall be sent to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt of the request and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(ii)(B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(2) Withholding. The subrecipient(s), shall upon written request of the EPA Award Official or an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the (Agency) may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(3) Payrolls and basic records.

(i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each

such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The contractor shall submit weekly, for each week in which any contract work is performed, a copy of all payrolls to the subrecipient, that is, the entity that receives the sub-grant or loan from the State capitalization grant recipient. Such documentation shall be available on request of the State recipient or EPA. As to each payroll copy received, the subrecipient shall provide written confirmation in a form satisfactory to the State indicating whether or not the project is in compliance with the requirements of 29 CFR 5.5(a)(1) based on the most recent payroll copies for the specified week. The payrolls shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on the weekly payrolls. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at http://www.dol.gov/whd/forms/wh347instr.htm or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the subrecipient(s) for transmission to the State or EPA if requested by EPA , the State, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the subrecipient(s).

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under § 5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under § 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the “Statement of Compliance” required by paragraph (a)(3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the State, EPA or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency or State may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4) Apprentices and trainees--

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the

applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

(5) Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

(6) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the EPA determines may by appropriate, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

(7) Contract termination; debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(8) Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

(9) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and Subrecipient(s), State, EPA, the U.S. Department of Labor, or the employees or their representatives.

(10) Certification of eligibility.

(i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

4. **Contract Provision for Contracts in Excess of $100,000.**

(a) Contract Work Hours and Safety Standards Act. The subrecipient shall insert the following clauses set forth in paragraphs (a)(1), (2), (3), and (4) of this section in full in any contract in an amount in excess of $100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by Item 3, above or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (a)(1) of this section the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (a)(1) of this section, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (a)(1) of this section.

(3) Withholding for unpaid wages and liquidated damages. The subrecipient**,** upon written request of the EPA Award Official or an authorized representative of the Department of Labor, shall withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or

any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (a)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (a)(1) through (4) of this section.

(b) In addition to the clauses contained in Item 3, above, in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in 29 CFR 5.1, the Subrecipient shall insert a clause requiring that the contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the Subrecipient shall insert in any such contract a clause providing hat the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the (write the name of agency) and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

5. Compliance Verification

(a) The subrecipient shall periodically interview a sufficient number of employees entitled to DB prevailing wages (covered employees) to verify that contractors or subcontractors are paying the appropriate wage rates. As provided in 29 CFR 5.6(a)(6), all interviews must be conducted in confidence. The subrecipient must use Standard Form 1445 (SF 1445) or equivalent documentation to memorialize the interviews. Copies of the SF 1445 are available from EPA on request.

(b) The subrecipient shall establish and follow an interview schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. Subrecipients must conduct more frequent interviews if the initial interviews or other information indicated that there is a risk that the contractor or subcontractor is not complying with DB. Subrecipients shall immediately conduct interviews in response to an alleged violation of the prevailing wage requirements. All interviews shall be conducted in confidence."

(c) The subrecipient shall periodically conduct spot checks of a representative sample of weekly payroll data to verify that contractors or subcontractors are paying the appropriate wage rates. The subrecipient shall establish and follow a spot check schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. At a minimum, if practicable, the subrecipient should spot check payroll data within two weeks of each contractor or subcontractor’s submission of its initial payroll data and two weeks prior to the completion date the contract or subcontract . Subrecipients must conduct more frequent spot checks if the initial spot check or other information indicates that there is a risk that the contractor or

subcontractor is not complying with DB. In addition, during the examinations the subrecipient shall verify evidence of fringe benefit plans and payments thereunder by contractors and subcontractors who claim credit for fringe benefit contributions.

(d) The subrecipient shall periodically review contractors and subcontractors use of apprentices and trainees to verify registration and certification with respect to apprenticeship and training programs approved by either the U.S Department of Labor or a state, as appropriate, and that contractors and subcontractors are not using disproportionate numbers of, laborers, trainees and apprentices. These reviews shall be conducted in accordance with the schedules for spot checks and interviews described in Item 5(b) and (c) above.

(e) Subrecipients must immediately report potential violations of the DB prevailing wage requirements to the EPA DB contact listed above and to the appropriate DOL Wage and Hour District Office listed at http://www.dol.gov/contacts/whd/america2.htm.

II. Requirements Under The Consolidated and Further Continuing Appropriations Act, 2013 (P.L. 113-6) For Subrecipients That Are Not Governmental Entities:

The following terms and conditions specify how recipients will assist EPA in meeting its DB responsibilities when DB applies to EPA awards of financial assistance under the FY2013 Continuing Resolution with respect to subrecipients that are not governmental entities. If a subrecipient has questions regarding when DB applies, obtaining the correct DB wage determinations, DB provisions, or compliance monitoring, it may contact the State recipient for guidance. If a State recipient needs guidance, the recipient may contact Lorraine Fleury at fleury.lorraine@epa.gov or at 215-814-2341 of EPA, Region III Grants and Audit Management Branch for guidance. The recipient or subrecipient may also obtain additional guidance from DOL's web site at http://www.dol.gov/whd/

Under these terms and conditions, the subrecipient must submit its proposed DB wage determinations to the State recipient for approval prior to including the wage determination in any solicitation, contract task orders, work assignments, or similar instruments to existing contractors.

1._ Applicability of the Davis- Bacon (DB) prevailing wage requirements.

Under the FY 2013 Continuing Resolution, DB prevailing wage requirements apply to the construction, alteration, and repair of treatment works carried out in whole or in part with assistance made available by a State water pollution control revolving fund and to any construction project carried out in whole or in part by assistance made available by a drinking water treatment revolving loan fund. If a subrecipient encounters a unique situation at a site that presents uncertainties regarding DB applicability, the subrecipient must discuss the situation with the recipient State before authorizing work on that site.

2. Obtaining Wage Determinations.

(a) Subrecipients must obtain proposed wage determinations for specific localities at www.wdol.gov. After the Subrecipient obtains its proposed wage determination, it must submit the wage determination to **INSERT STATE CONTACT NAME, EMAIL, and TELEPHONE NUMBER** for approval prior to inserting the wage determination into a solicitation, contract or issuing task orders, work assignments or similar

instruments to existing contractors (ordering instruments unless subsequently directed otherwise by the State recipient Award Official.

(b) Subrecipients shall obtain the wage determination for the locality in which a covered activity subject to DB will take place prior to issuing requests for bids, proposals, quotes or other methods for soliciting contracts (solicitation) for activities subject to DB. These wage determinations shall be incorporated into solicitations and any subsequent contracts. Prime contracts must contain a provision requiring that subcontractors follow the wage determination incorporated into the prime contract.

(i) While the solicitation remains open, the subrecipient shall monitor www.wdol.gov. on a weekly basis to ensure that the wage determination contained in the solicitation remains current. The subrecipients shall amend the solicitation if DOL issues a modification more than 10 days prior to the closing date (i.e. bid opening) for the solicitation. If DOL modifies or supersedes the applicable wage determination less than 10 days prior to the closing date, the subrecipients may request a finding from the State recipient that there is not a reasonable time to notify interested contractors of the modification of the wage determination. The State recipient will provide a report of its findings to the subrecipient.

(ii) If the subrecipient does not award the contract within 90 days of the closure of the solicitation, any modifications or supersedes DOL makes to the wage determination contained in the solicitation shall be effective unless the State recipient, at the request of the subrecipient, obtains an extension of the 90 day period from DOL pursuant to 29 CFR 1.6(c)(3)(iv). The subrecipient shall monitor www.wdol.gov on a weekly basis if it does not award the contract within 90 days of closure of the solicitation to ensure that wage determinations contained in the solicitation remain current.

(c) If the subrecipient carries out activity subject to DB by issuing a task order, work assignment or similar instrument to an existing contractor (ordering instrument) rather than by publishing a solicitation, the subecipient shall insert the appropriate DOL wage determination from www.wdol.gov into the ordering instrument.

(c) Subrecipients shall review all subcontracts subject to DB entered into by prime contractors to verify that the prime contractor has required its subcontractors to include the applicable wage determinations.

(d) As provided in 29 CFR 1.6(f), DOL may issue a revised wage determination applicable to a subrecipient's contract after the award of a contract or the issuance of an ordering instrument if DOL determines that the subrecipient has failed to incorporate a wage determination or has used a wage determination that clearly does not apply to the contract or ordering instrument. If this occurs, the subecipient shall either terminate the contract or ordering instrument and issue a revised solicitation or ordering instrument or incorporate DOL's wage determination retroactive to the beginning of the contract or ordering instrument by change order. The subrecipient's contractor must be compensated for any increases in wages resulting from the use of DOL's revised wage determination.

3. Contract and Subcontract provisions.

(a) The Recipient shall insure that the subrecipient(s) shall insert in full in any contract in excess of $2,000 which is entered into for the actual construction, alteration and/or repair, including painting and

decorating, of a treatment work under the CWSRF or a construction project under the DWSRF financed in whole or in part from Federal funds or in accordance with guarantees of a Federal agency or financed from funds obtained by pledge of any contract of a Federal agency to make a loan, grant or annual contribution (except where a different meaning is expressly indicated), and which is subject to the labor standards provisions of any of the acts listed in § 5.1 or the FY 2013 Continuing Resolution, the following clauses:

(1) Minimum wages.

(i) All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in § 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

Subrecipients may obtain wage determinations from the U.S. Department of Labor's web site, www.dol.gov. .

(ii)(A) The subrecipient(s), on behalf of EPA, shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The State award official shall approve a request for an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the subrecipient(s) agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), documentation of the action taken and the request, including the local wage determination shall be sent by the subrecipient(s) to the State award official. The State award official will transmit the report, to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210 and to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification request within 30 days of receipt and so advise the State award official or will notify the State award official within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the and the subrecipient(s) do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the award official shall refer the request, and the local wage determination, including the views of all interested parties and the recommendation of the State award official, to the Administrator for determination. The request shall be sent to the EPA Regional Coordinator concurrently. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt of the request and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(ii)(B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(2) Withholding. The subrecipient(s) shall upon written request of the EPA Award Official or an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or

working on the site of the work, all or part of the wages required by the contract, the (Agency) may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(3) Payrolls and basic records.

(i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The contractor shall submit weekly, for each week in which any contract work is performed, a copy of all payrolls to the subrecipient, that is, the entity that receives the sub-grant or loan from the State capitalization grant recipient. Such documentation shall be available on request of the State recipient or EPA. As to each payroll copy received, the subrecipient shall provide written confirmation in a form satisfactory to the State indicating whether or not the project is in compliance with the requirements of 29 CFR 5.5(a)(1) based on the most recent payroll copies for the specified week. The payrolls shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on the weekly payrolls. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at http://www.dol.gov/whd/forms/wh347instr.htm or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the subrecipient(s) for transmission to the State or EPA if requested by EPA , the State, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the subrecipient(s).

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under § 5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under § 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (a)(3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the State, EPA or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency or State may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4) Apprentices and trainees--

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is

not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

(5) Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

(6) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the EPA determines may by appropriate, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

(7) Contract termination: debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(8) Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

(9) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and Subrecipient(s), State, EPA, the U.S. Department of Labor, or the employees or their representatives.

(10) Certification of eligibility.

(i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

4. **Contract Provision for Contracts in Excess of $100,000.**

(a) Contract Work Hours and Safety Standards Act. The subrecipient shall insert the following clauses set forth in paragraphs (a)(1), (2), (3), and (4) of this section in full in any contract in an amount in excess of $100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by Item 3, above or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (b)(1) of this section the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (b)(1) of this section, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.

(3) Withholding for unpaid wages and liquidated damages. The subrecipient shall upon the request of the EPA Award Official or an authorized representative of the Department of Labor, withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (a)(2) of this section.

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (b)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (b)(1) through (4) of this section.

(c) In addition to the clauses contained in Item 3, above, in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in 29 CFR 5.1, the Subrecipient shall insert a clause requiring that the contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the Subrecipient shall insert in any such contract a clause providing that the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the (write the name of agency) and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

5. Compliance Verification

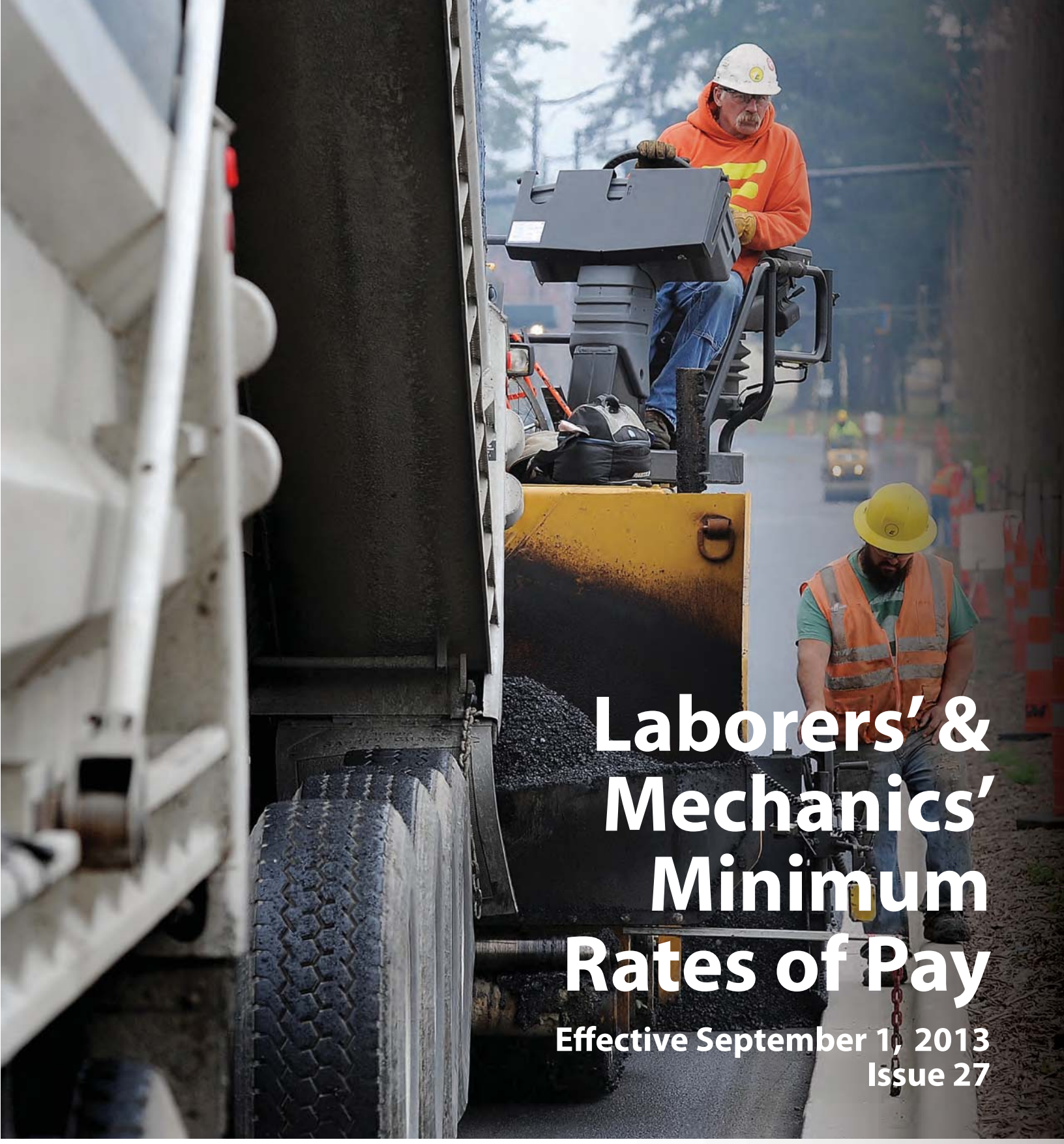
(a). The subrecipient shall periodically interview a sufficient number of employees entitled to DB prevailing wages (covered employees) to verify that contractors or subcontractors are paying the appropriate wage rates. As provided in 29 CFR 5.6(a)(6), all interviews must be conducted in confidence. The subrecipient must use Standard Form 1445 (SF 1445) or equivalent documentation to memorialize the interviews. Copies of the SF 1445 are available from EPA on request.

(b) The subrecipient shall establish and follow an interview schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. Subrecipients must conduct more frequent interviews if the initial interviews or other information indicated that there is a risk that the contractor or subcontractor is not complying with DB. Subrecipients shall immediately conduct interviews in response to an alleged violation of the prevailing wage requirements. All interviews shall be conducted in confidence."

(c). The subrecipient shall periodically conduct spot checks of a representative sample of weekly payroll data to verify that contractors or subcontractors are paying the appropriate wage rates. The subrecipient shall establish and follow a spot check schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. At a minimum, if practicable the subrecipient should spot check payroll data within two weeks of each contractor or subcontractor's submission of its initial payroll data and two weeks prior to the completion date the contract or subcontract. Subrecipients must conduct more frequent spot checks if the initial spot check or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB . In addition, during the examinations the subrecipient shall verify evidence of fringe benefit plans and payments thereunder by contractors and subcontractors who claim credit for fringe benefit contributions.

(d). The subrecipient shall periodically review contractors and subcontractors use of apprentices and trainees to verify registration and certification with respect to apprenticeship and training programs approved by either the U.S Department of Labor or a state, as appropriate, and that contractors and subcontractors are not using disproportionate numbers of, laborers, trainees and apprentices. These reviews shall be conducted in accordance with the schedules for spot checks and interviews described in Item 5(b) and (c) above.

(e) Subrecipients must immediately report potential violations of the DB prevailing wage requirements to the EPA DB contact listed above and to the appropriate DOL Wage and Hour District Office listed at http://www.dol.gov/whd/america2.htm.



Laborers' & Mechanics' Minimum Rates of Pay

Effective September 1, 2013
Issue 27

Title 36. Public Contracts
AS 36.05 & AS 36.10
Wage & Hour Administration
Pamphlet No. 600

ALASKA DEPARTMENT OF LABOR
& WORKFORCE DEVELOPMENT

THE STATE of ALASKA
GOVERNOR SEAN PARNELL

Department of Labor and Workforce Development

Office of the Commissioner

Post Office Box 111149
Juneau, Alaska 99811
Main: 907.465.2700
fax: 907.465-2784

September 1, 2013

TO ALL CONTRACTING AGENCIES:

At the Alaska Department of Labor and Workforce Development, our goal is putting Alaskans to work. This pamphlet is designed to help contractors awarded public construction contracts understand the most significant laws of the State of Alaska pertaining to prevailing wage and resident hire requirements.

This pamphlet identifies current prevailing wage rates and resident hire classifications for public construction contracts (any construction projects awarded by the State of Alaska or its political subdivisions, such as local governments and certain non-profit organizations).

Because these rates may change, this publication is printed in the spring and fall of every year, so please be sure you are using the appropriate rates. The rates published in this edition become effective September 1, 2013.

All projects with a final bid date of September 11, 2013, or later, must pay the prevailing wage rates contained in this pamphlet. As the law now provides, these rates will remain stable during the life of a contract or for 24 calendar months, whichever is shorter. **The date the prime contract is awarded is the date from which the 24 months will be counted.** Upon expiration of the initial 24-month period, the latest wage rates issued by the department shall become effective for a subsequent 24-month period or until the original contract is completed, whichever occurs first. This process shall be repeated until the original contract is completed.

The term "original contract", as used herein, means the signed contract that resulted from the original bid and any amendments, including changes of work scope, additions, extensions, change orders, and other instruments agreed to by the parties that have not been subject to subsequent open bid procedures.

If a higher federal rate is required due to partial federal funding or other federal participation, the higher rate must be paid.

For additional copies of this pamphlet, contact the nearest office of the Division of Labor Standards and Safety, Wage and Hour office or visit the Internet site at:

http://labor.state.ak.us/lss/pamp600.htm

For questions regarding prevailing wage or resident hire requirements, please contact the nearest Wage and Hour office. These offices are listed on Page xi.

Sincerely,

Dianne Blumer

Dianne Blumer
Commissioner

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Excerpts from Alaska Law

Additional Information

Note to Readers: The statutes and administrative regulations listed in this publication were taken from the official codes, as of the effective date of the publication. However, there may be errors or omissions that have not been identified and changes that occurred after the publication was printed. This publication is intended as an informational guide only and is not intended to serve as a precise statement of the statutes and regulations of the State of Alaska. To be certain of the current laws and regulations, please refer to the official codes.

EXCERPTS FROM ALASKA LAW

(The following statute (36.05.005) applies to projects bid on or after October 20, 2011)

Sec. 36.05.005. Applicability.

This chapter applies only to a public construction contract that exceeds $25,000.

Sec. 36.05.010. Wage rates on public construction.

A contractor or subcontractor who performs work on a public construction contract in the state shall pay not less than the current prevailing rate of wages for work of a similar nature in the region in which the work is done. The current prevailing rate of wages is that contained in the latest determination of prevailing rate of wages issued by the Department of Labor and Workforce Development at least 10 days before the final date for submission of bids for the contract. The rate shall remain in effect for the life of the contract or for 24 calendar months, whichever is shorter. At the end of the initial 24-month period, if new wage determinations have been issued by the department, the latest wage determination shall become effective for the next 24-month period or until the contract is completed, whichever occurs first. This process shall be repeated until the contract is completed.

Sec. 36.05.040. Filing schedule of employees, wages paid, and other information.

All contractors or subcontractors who perform work on a public construction contract for the state or for a political subdivision of the state shall, before the Friday of every second week, file with the Department of Labor and Workforce Development a sworn affidavit for the previous reporting period, setting out in detail the number of persons employed, wages paid, job classification of each employee, hours worked each day and week, and other information on a form provided by the Department of Labor and Workforce Development.

Sec. 36.05.045. Notice of work and completion; withholding of payment.

(a) Before commencing work on a public construction contract, the person entering into the contract with a contracting agency shall designate a primary contractor for purposes of this section. Before work commences, the primary contractor shall file a notice of work with the Department of Labor and Workforce Development. The notice of work must list work to be performed under the public construction contract by each contractor who will perform any portion of work on the contract and the contract price being paid to each contractor. The primary contractor shall pay all filing fees for each contractor performing work on the contract, including a filing fee based on the contract price being paid for work performed by the primary contractor's employees. The filing fee payable shall be the sum of all fees calculated for each contractor. The filing fee shall be one percent of each contractor's contract price. The total filing fee payable by the primary contractor under this subsection may not exceed $5,000. In this subsection, "contractor" means an employer who is using employees to perform work on the public construction contract under the contract or a subcontract.

(b) Upon completion of all work on the public construction contract, the primary contractor shall file with the Department of Labor and Workforce Development a notice of completion together with payment of any additional filing fees owed due to increased contract amounts. Within 30 days after the department's receipt of the primary contractor's notice of completion, the department shall inform the contracting agency of the amount, if any, to be withheld from the final payment.

(c) A contracting agency

(1) may release final payment of a public construction contract to the extent that the agency has received verification from the Department of Labor and Workforce Development that

(A) the primary contractor has complied with (a) and (b) of this section;

(B) the Department of Labor and Workforce Development is not conducting an investigation under this title; and

(C) the Department of Labor and Workforce Development has not issued a notice of a violation of this chapter to the primary contractor or any other contractors working on the public construction contract; and

(2) shall withhold from the final payment an amount sufficient to pay the department's estimate of what may be needed to compensate the employees of any contractors under investigation on this construction contract, and any unpaid filing fees.

(d) The notice and filing fee required under (a) of this section may be filed after work has begun if
  (1) The public construction contract is for work undertaken in immediate response to an emergency; and
  (2) The notice and fees are filed not later than 14 days after the work has begun.

(e) A false statement made on a notice required by this section is punishable under AS 11.56.210.

Sec. 36.05.060. Penalty for violation of this chapter.

A contractor who violates this chapter is guilty of a misdemeanor and upon conviction is punishable by a fine of not less than $100 nor more than $1,000, or by imprisonment for not less than 10 days nor more than 90 days, or by both. Each day a violation exists constitutes a separate offense.

Sec. 36.05.070. Wage rates in specifications and contracts for public works.

(a) The advertised specifications for a public construction contract that requires or involves the employment of mechanics, laborers, or field surveyors must contain a provision stating the minimum wages to be paid various classes of laborers, mechanics, or field surveyors and that the rate of wages shall be adjusted to the wage rate under AS 36.05.010.

(b) Repealed by §17 ch 142 SLA 1972.

(c) A public construction contract under (a) of this section must contain provisions that
  (1) the contractor or subcontractors of the contractor shall pay all employees unconditionally and not less than once a week;
  (2) wages may not be less than those stated in the advertised specifications, regardless of the contractual relationship between the contractor or subcontractors and laborers, mechanics, or field surveyors;
  (3) the scale of wages to be paid shall be posted by the contractor in a prominent and easily accessible place at the site of the work;
  (4) the state or a political subdivision shall withhold so much of the accrued payments as is necessary to pay to laborers, mechanics, or field surveyors employed by the contractor or subcontractors the difference between
    (A) the rates of wages required by the contract to be paid laborers, mechanics, or field surveyors on the work; and
    (B) the rates of wages in fact received by laborers, mechanics, or field surveyors.

Sec. 36.05.080. Failure to pay agreed wages.

Every contract within the scope of AS 36.05.070 shall contain a provision that if it is found that a laborer, mechanic, or field surveyor employed by the contractor or subcontractor has been or is being paid a rate of wages less than the rate of wages required by the contract to be paid, the state or its political subdivision may, by written notice to the contractor, terminate the contractor's right to proceed with the work or the part of the work for which there is a failure to pay the required wages and to prosecute the work to completion by contract or otherwise, and the contractor and the contractor's sureties are liable to the state or its political subdivision for excess costs for completing the work.

Sec. 36.05.090. Payment of wages from withheld payments and listing contractors who violate contracts.

(a) The state disbursing officer in the case of a state public construction contract and the local fiscal officer in the case of a political subdivision public construction contract shall pay directly to laborers, mechanics, or field surveyors from accrued payments withheld under the terms of the contract the wages due laborers, mechanics, or field surveyors under AS 36.05.070.

(b) The state disbursing officer or the local fiscal officer shall distribute to all departments of the state government and to all political subdivisions of the state a list giving the names of persons who have disregarded their obligations to employees. A person appearing on this list and a firm, corporation,

partnership, or association in which the person has an interest may not 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. If the accrued payments withheld under the contract are insufficient to reimburse all the laborers, mechanics, or field surveyors with respect to whom there has been a failure to pay the wages required under AS 36.05.070, the laborers, mechanics, or field surveyors have the right of action or intervention or both against the contractor and the contractor's sureties conferred by law upon persons furnishing labor or materials, and in the proceedings it is not a defense that the laborers, mechanics, or field surveyors accepted or agreed to accept less than the required rate of wages or voluntarily made refunds.

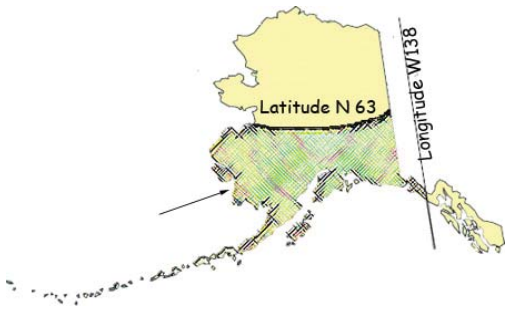
Sec. 36.05.900. Definition.
In this chapter, "contracting agency" means the state or a political subdivision of the state that has entered into a public construction contract with a contractor.

ADDITIONAL INFORMATION

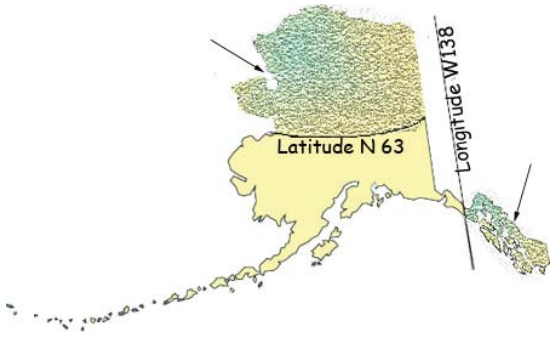
LABORER CLASSIFICATION CLARIFICATION

The laborer rates categorized in class code S1201-S1206 apply in one area of Alaska; the area that is south of N63 latitude and west of W138 Longitude. The laborer rates categorized in class code N1201-N1206 apply in two areas of Alaska; the Alaska areas north of N63 latitude and east of W138 longitude. The following graphic representations should assist with clarifying the applicable wage rate categories:

S1201-S1206



N1201-N1206



ACCOMMODATIONS AND PER DIEM

The Alaska Department of Labor and Workforce Development has adopted a per diem requirement for blocklayers, bricklayers, carpenters, dredgemen, heat & frost insulators/asbestos workers, ironworkers, laborers, operative plasterers & cement masons, painters, piledrivers, power equipment operators, roofers, surveyors, truck

drivers/surveyors, and tunnel workers. This per diem rate creates an allowable alternative to providing board and lodging under the following conditions:

Employer-Provided Camp or Suitable Accommodations

Unless otherwise approved by the Commissioner, the employer shall ensure that a worker who is employed on a project that is 65 road miles or more from the international airport in either Fairbanks, Juneau or Anchorage or is inaccessible by road in a 2-wheel drive vehicle and who is not a domiciled resident of the locality of the project shall receive meals and lodging. Lodging shall be in accordance with all applicable state and federal laws. In cases where the project site is not road accessible, but the employee can reasonably get to the project worksite from their permanent residence within one hour, the Commissioner may waive these requirements for that employee upon a written request from the employer.

The term "domiciled resident" means a person living within 65 road miles of the project, or in the case of a highway project, the mid-point of the project, for at least 12 consecutive months prior to the award of the project. However, if the employer or person provides sufficient evidence to convince the department that a person has established a permanent residence and an intent to remain indefinitely within the distance to be considered a "domiciled resident," the employer shall not be required to provide meals and lodging or pay per diem.

Where the employer provides or furnishes board, lodging or any other facility, the cost or amount thereof shall not be considered or included as part of the required prevailing wage basic hourly rate and cannot be applied to meet other fringe benefit requirements. The taxability of employer provided board and lodging shall be determined by the appropriate taxation enforcement authority.

Per Diem

Employers are encouraged to use commercial facilities and lodges; however, when such facilities are not available, per diem in lieu of meals and lodging must be paid at the basic rate of $75.00 per day, or part thereof, the worker is employed on the project. Per diem shall not be allowed on highway projects west of Livengood on the Elliott Highway, at Mile 0 of the Dalton Highway to the North Slope of Alaska, north of Mile 20 on the Taylor Highway, east of Chicken, Alaska, on the Top of the World Highway and south of Tetlin Junction to the Alaska-Canada border.

The above-listed standards for room and board and per diem only apply to the crafts as identified in Pamphlet 600, *Laborers' and Mechanics' Minimum Rates of Pay*. Other crafts working on public construction projects shall be provided room and board at remote sites based on the department's existing policy guidelines. In the event that a contractor provides lodging facilities, but no meals, the department will accept payment of $36 per day for meals to meet the per diem requirements.

APPRENTICE HIRING REQUIREMENTS

On July 24, 2005, Administrative Order No. 226 established a 15 percent goal for hiring apprentices in certain job categories on highway, airport, harbor, dam, tunnel, utility or dredging projects awarded by the Alaska Department of Transportation and Public Facilities that exceed $2.5 million. This Order will apply to all projects in the referenced categories that are advertised after September 1, 2005. On these projects, the hours worked by apprentices will be compared to the hours worked by journeyman level workers to determine if the 15 percent goal has been met. This on-the-job training goal is critical to ensure that the Alaska work force is prepared for the future. For additional details, contact the nearest Wage and Hour office at the address listed on Page xi of this publication. Administrative Order No. 226 may be viewed in its entirety on the Internet at http://www.gov.state.ak.us/admin-orders/226.html or call any Wage and Hour office to receive a copy.

APPRENTICE RATES

Apprentice rates at less than the minimum prevailing rates may be paid to apprentices according to an apprentice program which has been registered and approved by the Commissioner of the Alaska Department of Labor and Workforce Development in writing or according to a bona fide apprenticeship program registered with the U.S. Department of Labor, Office of Apprenticeship. **Any employee listed on a payroll at an apprentice wage rate who is not registered as above shall be paid the journeyman prevailing minimum wage in that work classification.** Wage rates are based on prevailing crew makeup practices in Alaska and apply to work performed regardless of either the quality of the work performed by the employee or the titles or classifications which may be assigned to individual employees.

FRINGE BENEFIT PLANS

Contractors/subcontractors may compensate fringe benefits to their employees in any one of three methods. The fringe benefits may be paid into a union trust fund, into an approved benefit plan, or paid directly on the paycheck as gross wages.

Where fringe benefits are paid into approved plans, funds, or programs including union trust funds, the payments must be contributed at least monthly. If contractors submit their own payroll forms and are paying fringe benefits into approved plans, funds, or programs, the employer's certification must include, in addition to those requirements of 8 AAC 30.020(c), a statement that fringe benefit payments have been or will be paid at least monthly. Contractors who pay fringe benefits to a plan must ensure the plan is one approved by the Internal Revenue Service and that the plan meets the requirements of 8 AAC 30.025 (eff. 3/2/08) in order for payments to be credited toward the prevailing wage obligation.

SPECIAL PREVAILING WAGE RATE DETERMINATION

Special prevailing wage rate determinations may be requested for special projects or a special worker classification if the work to be performed does not conform to traditional public construction for which a prevailing wage rate has been established under 8 AAC 30.050(a) of this section. Requests for special wage rate determinations must be in writing and filed with the Commissioner at least 30 days before the award of the contract. An applicant for a special wage rate determination shall have the responsibility to support the necessity for the special rate. An application for a special wage rate determination filed under this section must contain:

(1) a specification of the contract or project on which the special rates will apply and a description of the work to be performed;
(2) a brief narrative explaining why special wage rates are necessary;
(3) the job class or classes involved;
(4) the special wage rates the applicant is requesting, including survey or other relevant wage data to support the requested rates;
(5) the approximate number of employees who would be affected; and
(6) any other information which might be helpful in determining if special wage rates are appropriate.

Requests made pursuant to the above should be addressed to:

Director
Alaska Department of Labor and Workforce Development
Labor Standards & Safety Division
Wage and Hour Administration
P.O. Box 111149
Juneau, AK 99811-1149
-or-
Email: anchorage.lss-wh@alaska.gov

LABOR STANDARDS REGULATIONS
NOTICE REQUEST

If you would like to receive ***notices of proposed changes to regulations*** for Wage and Hour or Mechanical Inspection, please indicate below the programs for which you are interested in receiving such notices, print your name and email or mailing address in the space provided, and send this page to:

Alaska Department of Labor and Workforce Development
Labor Standards & Safety Division
Wage and Hour Administration
1251 Muldoon Road, Suite 113
Anchorage, AK 99504-2098
Email: anchorage.lss-wh@alaska.gov

For *REGULATIONS* information relating to any of the following:

❒ Wage and Hour Title 23 Employment Practices
❒ Wage and Hour Title 36 Public Works
❒ Employment Agencies
❒ Child Labor
❒ Employment Preference (Local Hire)
❒ Plumbing Code
❒ Electrical Code
❒ Boiler/Pressure Vessel Construction Code
❒ Elevator Code
❒ Certificates of Fitness
❒ Recreational Devices

Request any of the following *PUBLICATIONS* by checking below:

❒ Wage and Hour Title 23 Employment Practices
❒ Minimum Wage & Overtime Poster
❒ Child Labor Poster
❒ Public Construction Pamphlet
❒ Public Construction Wage Rates
❒ Child Labor Pamphlet

PLEASE NOTE: DUE TO INCREASED MAILING AND PRINTING COSTS, ONLY ONE OF EACH PUBLICATION REQUESTED WILL BE MAILED TO YOU. IF YOU WISH TO RECEIVE ADDITIONAL COPIES OR SUBSEQUENT PUBLICATIONS, PLEASE CONTACT OUR OFFICE AT (907) 269-4900.

Name: _____

Mailing Address: _____

_____

_____

_____

Email Address: _____

EMPLOYMENT PREFERENCE INFORMATION
(EFFECTIVE August 16, 2013)

By authority of AS 36.10.150 and 8 AAC 30.064, the Commissioner of Labor and Workforce Development has determined the 15 boroughs and census areas listed below to be Zones of Underemployment. A Zone of Underemployment requires that Alaska residents who are eligible under AS 36.10.140 be given a minimum of 90 percent employment preference on public works contracts throughout the state in certain job classifications. This hiring preference applies on a project-by-project, craft-by-craft or occupational basis and must be met each workweek by each contractor/subcontractor.

For additional information about the Alaska resident hire requirements, contact the nearest Wage and Hour Office in Anchorage at (907) 269-4900, in Fairbanks at (907) 451-2886 or in Juneau at (907) 465-4248.

The following classifications qualify for a minimum of 90 percent Alaska resident hire preference:

Aleutians East Borough: Plumbers and Pipefitters
Aleutians West Borough: Painters
Bethel Census Area: Culinary Workers, Foremen and Supervisors, Mechanics, Painters, Surveyors, Tug Boat Workers
Denali Borough: Carpenters
Dillingham Census Area: Carpenters, Culinary Workers, Electricians, Equipment Operators, Foremen and Supervisors, Laborers, Mechanics, Truck Drivers, Tug Boat Workers
Hoonah-Angoon Census Area: Carpenters, Culinary Workers, Electricians, Equipment Operators, Foremen and Supervisors, Laborers, Mechanics, Painters, Truck Drivers
Nome Census Area: Carpenters, Culinary Workers, Electricians, Equipment Operators, Foremen and Supervisors, Laborers, Mechanics, Surveyors, Truck Drivers, Tug Boat Workers, Welders
Northwest Arctic Borough: Carpenters, Culinary Workers, Electricians, Equipment Operators, Foremen and Supervisors, Plumbers and Pipefitters, Surveyors, Truck Drivers, Tug Boat Workers, Welders
Petersburg Borough: Culinary Workers, Engineers and Architects, Foremen and Supervisors, Laborers
Prince of Wales-Hyder Census Area: Carpenters, Culinary Workers, Electricians, Equipment Operators, Foremen and Supervisors, Laborers, Mechanics, Surveyors, Truck Drivers, Welders
Skagway: None
Southeast Fairbanks Census Area: Carpenters, Culinary Workers, Equipment Operators, Laborers, Painters, Truck Drivers
Wade Hampton Census Area: Carpenters, Electricians, Engineers and Architects, Mechanics, Roofers
Yakutat: None
Yukon-Koyukuk Census Area: Culinary Workers, Electricians, Foremen and Supervisors, Painters, Plumbers and Pipefitters, Surveyors, Truck Drivers, Tug Boat Workers, Welders

This determination is effective August 16, 2013, and remains in effect until June 30, 2015.

The first person on a certified payroll in any classification is called the "first worker" and is not required to be an Alaskan resident. However, once the contractor adds any more workers in the classification, then all workers in the classification are counted, and the 90 percent is applied to compute the number of required Alaskans to be in compliance. To compute the number of Alaskan residents required in a workweek in a particular classification, multiply the number of workers in the classification by 90 percent. The result is then rounded down to the nearest whole number to determine the number of Alaskans that must be employed.

If a worker works in more than one classification during a week, the classification in which they spent the most time would be counted for employment preference purposes. If the time is split evenly between two classifications, the worker is counted in both classifications.

If you have difficulty meeting the 90 percent requirement, an approved waiver must be obtained before a non-Alaskan resident is hired who would put the contractor/subcontractor out of compliance (8 AAC 30.081 (e) (f)). The waiver process requires proof of an intensive search for qualified Alaskan workers. To apply for a waiver, contact the nearest Wage and Hour Office for instructions.

Here is an example to apply the 90 percent requirement to four carpenter workers. Multiply four workers by 90% and drop the fraction (.90 X 4 = 3.6 - .6 = 3). The remaining number is the number of Alaskan resident carpenters required to be in compliance in that particular classification for that week.

The penalties for being out of compliance are serious. AS 36.10.100 (a) states "A contractor who violates a provision of this chapter shall have deducted from amounts due to the contractor under the contract the prevailing wages which should have been paid to a displaced resident, and these amounts shall be retained by the contracting agency." If a contractor/subcontractor is found to be out of compliance, penalties accumulate until they come into compliance.

If you have difficulty determining whether a worker is an Alaska resident, you should contact the nearest Wage and Hour Office. Contact Wage and Hour in Anchorage at (907) 269-4900, in Fairbanks at (907) 451-2886, or in Juneau at (907) 465-4842.

Alaska Department of Labor and Workforce Development
Labor Standards & Safety Division
Wage and Hour Administration
Web site: http://labor.state.ak.us/lss/pamp600.htm

Anchorage	Juneau	Fairbanks
1251 Muldoon Road, Suite 113 Anchorage, Alaska 99504-2098 Phone: (907) 269-4900 Email: anchorage.lss-wh@alaska.gov	1111 W. 8th Street, Suite 302 Juneau, Alaska 99801 Phone: (907) 465-4842 Email: juneau.lss-wh@alaska.gov	Regional State Office Building 675 7th Ave., Station J-1 Fairbanks, Alaska 99701-4593 Phone: (907) 451-2886 Email: fairbanks.lss@alaska.gov

DEBARMENT LIST

AS 36.05.090(b) states that "the state disbursing officer or the local fiscal officer shall distribute to all departments of the state government and to all political subdivisions of the state a list giving the names of persons who have disregarded their obligations to employees."

A person appearing on the following debarment list and a firm, corporation, partnership, or association in which the person has an interest may not work as a contractor or subcontractor on a public construction contract for the state or a political subdivision of the state for three years from the date of debarment.

Company Name	Date of Debarment	Debarment Expires

No companies are currently debarred.

Laborers' & Mechanics' Minimum Rates of Pay

Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other Benefits		THR
Boilermakers								
						VAC	**SAF**	
A0101	Boilermaker (journeyman)	42.97	8.57	14.28	0.75	3.00	0.34	69.91
Bricklayers & Blocklayers								
	**See note on last page if remote site							
						L&M		
A0201	Blocklayer	39.03	9.53	8.50	0.55	0.15	0.28	58.04
	Bricklayer							
	Marble or Stone Mason							
	Refractory Worker (Firebrick, Plastic, Castable, and Gunite Refractory Applications)							
	Terrazzo Worker							
	Tile Setter							
						L&M		
A0202	Tuck Pointer Caulker	39.03	9.53	8.50	0.55	0.15	0.28	58.04
	Cleaner (PCC)							
						L&M		
A0203	Marble & Tile Finisher	33.27	9.53	8.50	0.55	0.15	0.28	52.28
	Terrazzo Finisher							
						L&M		
A0204	Torginal Applicator	37.14	9.53	8.50	0.55	0.15	0.28	56.15
Carpenters, Statewide								
	**See note on last page if remote site							
						L&M	**SAF**	
A0301	Carpenter (journeyman)	36.59	9.78	12.11	0.70	0.10	0.15	59.43
	Lather/Drywall/Acoustical							
Cement Masons, Region I (North of N63 latitude)								
	**See note on last page if remote site							
						L&M		
N0401	Group I, including:	34.69	6.91	11.80	0.85	0.10		54.35
	Application of Sealing Compound							
	Application of Underlayment							
	Building, General							
	Cement Mason (journeyman)							
	Concrete							
	Concrete Paving							
	Curb & Gutter, Sidewalk							
	Curing of All Concrete							
	Grouting & Caulking of Tilt-Up Panels							

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; ONT=overnight; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other Benefits	THR
Cement Masons, Region I (North of N63 latitude)							
	**See note on last page if remote site						
						L&M	
N0401	Group I, including:	34.69	6.91	11.80	0.85	0.10	54.35
	Grouting of All Plates						
	Patching Concrete						
	Screed Pin Setter						
	Spackling/Skim Coating						
						L&M	
N0402	Group II, including:	34.69	6.91	11.80	0.85	0.10	54.35
	Form Setter						
						L&M	
N0403	Group III, including:	34.69	6.91	11.80	0.85	0.10	54.35
	Concrete Saw (self-powered)						
	Curb & Gutter Machine						
	Floor Grinder						
	Pneumatic Power Tools						
	Power Chipping & Bushing						
	Sand Blasting Architectural Finish						
	Screed & Rodding Machine Operator						
	Troweling Machine Operator						
						L&M	
N0404	Group IV, including:	34.69	6.91	11.80	0.85	0.10	54.35
	Application of All Composition Mastic						
	Application of All Epoxy Material						
	Application of All Plastic Material						
	Finish Colored Concrete						
	Gunite Nozzleman						
	Hand Powered Grinder						
	Tunnel Worker						
						L&M	
N0405	Group V, including:	34.94	6.91	11.80	0.85	0.10	54.60
	Plasterer						
Cement Masons, Region II (South of N63 latitude)							
	**See note on last page if remote site						
						L&M	
S0401	Group I, including:	34.44	6.91	11.80	0.85	0.10	54.10
	Application of Sealing Compound						
	Application of Underlayment						
	Building, General						
	Cement Mason (journeyman)						
	Concrete						
	Concrete Paving						
	Curb & Gutter, Sidewalk						
	Curing of All Concrete						

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; ONT=overnight; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other Benefits	THR
Cement Masons, Region II (South of N63 latitude)							
	**See note on last page if remote site						
						L&M	
S0401	Group I, including:	34.44	6.91	11.80	0.85	0.10	54.10
	Grouting & Caulking of Tilt-Up Panels						
	Grouting of All Plates						
	Patching Concrete						
	Screed Pin Setter						
	Spackling/Skim Coating						
						L&M	
S0402	Group II, including:	34.44	6.91	11.80	0.85	0.10	54.10
	Form Setter						
						L&M	
S0403	Group III, including:	34.44	6.91	11.80	0.85	0.10	54.10
	Concrete Saw (self-powered)						
	Curb & Gutter Machine						
	Floor Grinder						
	Pneumatic Power Tools						
	Power Chipping & Bushing						
	Sand Blasting Architectural Finish						
	Screed & Rodding Machine Operator						
	Troweling Machine Operator						
						L&M	
S0404	Group IV, including:	34.44	6.91	11.80	0.85	0.10	54.10
	Application of All Composition Mastic						
	Application of All Epoxy Material						
	Application of All Plastic Material						
	Finish Colored Concrete						
	Gunite Nozzleman						
	Hand Powered Grinder						
	Tunnel Worker						
						L&M	
S0405	Group V, including:	34.69	6.91	11.80	0.85	0.10	54.35
	Plasterer						
Culinary Workers * See note on last page							
						LEG	
A0501	Baker/Cook	24.67	5.37	5.73		0.05	35.82
						LEG	
A0503	General Helper	21.62	5.37	5.73		0.05	32.77
	Housekeeper						
	Janitor						
	Kitchen Helper						
						LEG	
A0504	Head Cook	25.22	5.37	5.73		0.05	36.37

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; ONT=overnight; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other Benefits	THR
Culinary Workers * See note on last page							
						LEG	
A0505	Head Housekeeper	21.54	5.37	5.38		0.05	32.34
	Head Kitchen Help						
Dredgemen							
	**See note on last page if remote site						
						L&M	
A0601	Assistant Engineer, including:	37.51	9.10	9.75	1.00	0.10	57.46
	Craneman						
	Electrical Generator Operator (primary pump/power barge/dredge)						
	Engineer						
	Welder						
						L&M	
A0602	Assistant Mate (deckhand)	36.35	9.10	9.75	1.00	0.10	56.30
						L&M	
A0603	Fireman	36.79	9.10	9.75	1.00	0.10	56.74
						L&M	
A0605	Leverman Clamshell	40.04	9.10	9.75	1.00	0.10	59.99
						L&M	
A0606	Leverman Hydraulic	38.28	9.10	9.75	1.00	0.10	58.23
						L&M	
A0607	Mate & Boatman	37.51	9.10	9.75	1.00	0.10	57.46
						L&M	
A0608	Oiler (dredge)	36.79	9.10	9.75	1.00	0.10	56.74
Electricians							
						L&M	LEG
A0701	Inside Cable Splicer	39.87	10.53	12.60	0.85	0.20	0.15 64.20
						L&M	LEG
A0702	Inside Journeyman Wireman, including:	38.12	10.53	12.54	0.85	0.20	0.15 62.39
	Communications and Technicians						
						L&M	LEG
A0703	Power Cable Splicer	50.52	10.53	15.67	0.85	0.20	0.15 77.92
						L&M	LEG
A0704	Tele Com Cable Splicer	47.03	10.53	14.56	0.85	0.20	0.15 73.32
						L&M	LEG
A0705	Power Journeyman Lineman, including:	48.77	10.53	15.61	0.85	0.20	0.15 76.11
	Power Equipment Operator						
	Technician						
						L&M	LEG
A0706	Tele Com Journeyman Lineman, including:	45.28	10.53	14.51	0.85	0.20	0.15 71.52
	Technician						
	Tele Com Equipment Operator						

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; ONT=overnight; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other Benefits		THR
Electricians								
						L&M	**LEG**	
A0707	Straight Line Installer - Repairman	45.28	10.53	14.51	0.85	0.20	0.15	71.52
						L&M	**LEG**	
A0708	Powderman	46.77	10.53	15.55	0.85	0.20	0.15	74.05
						L&M	**LEG**	
A0710	Material Handler	25.90	9.89	4.53	0.15	0.15	0.15	40.77
						L&M	**LEG**	
A0712	Tree Trimmer Groundman	25.45	10.53	9.41	0.15	0.15	0.15	45.84
						L&M	**LEG**	
A0713	Journeyman Tree Trimmer	34.12	10.53	9.67	0.15	0.15	0.15	54.77
						L&M	**LEG**	
A0714	Vegetation Control Sprayer	37.57	10.53	9.78	0.15	0.15	0.15	58.33
Elevator Workers								
						L&M	**VAC**	
A0802	Elevator Constructor	34.70	11.88	12.71	0.60	0.30	3.16	63.35
						L&M	**VAC**	
A0803	Elevator Constructor Mechanic	49.58	11.88	12.71	0.60	0.30	5.51	80.58
Heat & Frost Insulators/Asbestos Workers								
	**See note on last page if remote site							
						SAF		
A0902	Asbestos Abatement-Mechanical Systems	34.88	8.44	9.51	0.60	0.12		53.55
						SAF		
A0903	Asbestos Abatement/General Demolition All Systems	34.88	8.44	9.51	0.60	0.12		53.55
						SAF		
A0904	Insulator, Group II	34.88	8.44	9.51	0.60	0.12		53.55
						SAF		
A0905	Fire Stop	34.88	8.44	9.51	0.60	0.12		53.55
IronWorkers								
	**See note on last page if remote site							
						L&M	**IAF**	
A1101	Ironworkers, including:	33.55	7.58	17.00	0.95	0.43	0.10	59.61
	Bender Operators							
	Bridge & Structural							
	Machinery Mover							
	Ornamental							
	Reinforcing							
	Rigger							
	Sheeter							
	Signalman							
	Stage Rigger							
	Toxic Haz-Mat Work							

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; ONT=overnight; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other Benefits		THR
IronWorkers								
	**See note on last page if remote site							
						L&M	**IAF**	
A1101	Ironworkers, including:	33.55	7.58	17.00	0.95	0.43	0.10	59.61
	Welder							
						L&M	**IAF**	
A1102	Helicopter	34.55	7.58	17.00	0.95	0.43	0.10	60.61
	Tower (energy producing windmill type towers to include nacelle and blades)							
						L&M	**IAF**	
A1103	Fence/Barrier Installer	30.05	7.58	16.75	0.95	0.43	0.10	55.86
	Guard Rail Installer							
						L&M	**IAF**	
A1104	Guard Rail Layout Man	30.79	7.58	16.75	0.95	0.43	0.10	56.60
Laborers (The Alaska areas north of N63 latitude and east of W138 longitude)								
	**See note on last page if remote site							
						L&M	**LEG**	
N1201	Group I, including:	29.25	7.24	13.73	1.20	0.20	0.15	51.77
	Asphalt Worker (shovelman, plant crew)							
	Brush Cutter							
	Camp Maintenance Laborer							
	Carpenter Tender or Helper							
	Choke Setter, Hook Tender, Rigger, Signalman							
	Concrete Labor (curb & gutter, chute handler, grouting, curing, screeding)							
	Crusher Plant Laborer							
	Demolition Laborer							
	Ditch Digger							
	Dumpman							
	Environmental Laborer (hazard/toxic waste, oil spill)							
	Fence Installer							
	Fire Watch Laborer							
	Flagman							
	Form Stripper							
	General Laborer							
	Guardrail Laborer, Bridge Rail Installer							
	Hydro-seeder Nozzleman							
	Laborer, Building							
	Landscaper or Planter							
	Laying of Mortarless Decorative Block (retaining walls, flowered decorative block 4 feet or less - highway or landscape work)							
	Material Handler							
	Pneumatic or Power Tools							
	Portable or Chemical Toilet Serviceman							
	Pump Man or Mixer Man							
	Railroad Track Laborer							

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; ONT=overnight; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other Benefits		THR
Laborers (The Alaska areas north of N63 latitude and east of W138 longitude)								
	**See note on last page if remote site							
						L&M	LEG	
N1201	Group I, including:	29.25	7.24	13.73	1.20	0.20	0.15	51.77
	Sandblast, Pot Tender							
	Saw Tender							
	Slurry Work							
	Stake Hopper							
	Steam Cleaner Operator							
	Steam Point or Water Jet Operator							
	Tank Cleaning							
	Utiliwalk & Utilidor Laborer							
	Watchman (construction projects)							
	Window Cleaner							
						L&M	LEG	
N1202	Group II, including:	30.25	7.24	13.73	1.20	0.20	0.15	52.77
	Burning & Cutting Torch							
	Cement or Lime Dumper or Handler (sack or bulk)							
	Choker Splicer							
	Chucktender (wagon, air-track & hydraulic drills)							
	Concrete Laborer (power buggy, concrete saws, pumpcrete nozzleman, vibratorman)							
	Culvert Pipe Laborer							
	Cured Inplace Pipelayer							
	Environmental Laborer (asbestos, marine work)							
	Foam Gun or Foam Machine Operator							
	Green Cutter (dam work)							
	Gunite Operator							
	Hod Carrier							
	Jackhammer or Pavement Breaker (more than 45 pounds)							
	Laser Instrument Operator							
	Laying of Mortarless Decorative Block (retaining walls, flowered decorative block over 4 feet - highway or landscape work)							
	Mason Tender & Mud Mixer (sewer work)							
	Pilot Car							
	Pipelayer Helper							
	Plasterer, Bricklayer & Cement Finisher Tender							
	Powderman Helper							
	Power Saw Operator							
	Railroad Switch Layout Laborer							
	Sandblaster							
	Scaffold Building & Erecting							
	Sewer Caulker							
	Sewer Plant Maintenance Man							
	Thermal Plastic Applicator							
	Timber Faller, Chainsaw Operator, Filer							

Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other Benefits		THR
Laborers (The Alaska areas north of N63 latitude and east of W138 longitude)								
	**See note on last page if remote site							
						L&M	LEG	
N1202	Group II, including:	30.25	7.24	13.73	1.20	0.20	0.15	52.77
	Timberman							
						L&M	LEG	
N1203	Group III, including:	31.15	7.24	13.73	1.20	0.20	0.15	53.67
	Bit Grinder							
	Camera/Tool/Video Operator							
	Guardrail Machine Operator							
	High Rigger & Tree Topper							
	High Scaler							
	Multiplate							
	Plastic Welding							
	Slurry Seal Squeegee Man							
	Traffic Control Supervisor							
	Welding Certified (in connection with laborer's work)							
						L&M	LEG	
N1204	Group IIIA	34.43	7.24	13.73	1.20	0.20	0.15	56.95
	Asphalt Raker, Asphalt Belly Dump Lay Down							
	Drill Doctor (in the field)							
	Driller (including, but not limited to, wagon drills, air-track drills, hydraulic drills)							
	Licensed Powderman							
	Pioneer Drilling & Drilling Off Tugger (all type drills)							
	Pipelayers							
						L&M	LEG	
N1205	Group IV	18.82	7.24	13.73	1.20	0.20	0.15	41.34
	Final Building Cleanup							
	Permanent Yard Worker							
						L&M	LEG	
N1206	Group IIIB	35.26	7.24	13.73	1.20	0.20	0.15	57.78
	Federally Licensed Powderman (Responsible Person in Charge)							
	Grade Checking (setting or transferring of grade marks, line and grade)							
Laborers (The area that is south of N63 latitude and west of W138 longitude)								
	**See note on last page if remote site							
						L&M	LEG	
S1201	Group I, including:	29.25	7.24	13.73	1.20	0.20	0.15	51.77
	Asphalt Worker (shovelman, plant crew)							
	Brush Cutter							
	Camp Maintenance Laborer							
	Carpenter Tender or Helper							
	Choke Setter, Hook Tender, Rigger, Signalman							
	Concrete Labor (curb & gutter, chute handler, grouting, curing, screeding)							
	Crusher Plant Laborer							

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; ONT=overnight; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other Benefits		THR
Laborers (The area that is south of N63 latitude and west of W138 longitude)								
	**See note on last page if remote site							
						L&M	LEG	
S1201	Group I, including:	29.25	7.24	13.73	1.20	0.20	0.15	51.77
	Demolition Laborer							
	Ditch Digger							
	Dumpman							
	Environmental Laborer (hazard/toxic waste, oil spill)							
	Fence Installer							
	Fire Watch Laborer							
	Flagman							
	Form Stripper							
	General Laborer							
	Guardrail Laborer, Bridge Rail Installer							
	Hydro-seeder Nozzleman							
	Laborer, Building							
	Landscaper or Planter							
	Laying of Mortarless Decorative Block (retaining walls, flowered decorative block 4 feet or less - highway or landscape work)							
	Material Handler							
	Pneumatic or Power Tools							
	Portable or Chemical Toilet Serviceman							
	Pump Man or Mixer Man							
	Railroad Track Laborer							
	Sandblast, Pot Tender							
	Saw Tender							
	Slurry Work							
	Stake Hopper							
	Steam Cleaner Operator							
	Steam Point or Water Jet Operator							
	Tank Cleaning							
	Utiliwalk & Utilidor Laborer							
	Watchman (construction projects)							
	Window Cleaner							
						L&M	LEG	
S1202	Group II, including:	30.25	7.24	13.73	1.20	0.20	0.15	52.77
	Burning & Cutting Torch							
	Cement or Lime Dumper or Handler (sack or bulk)							
	Choker Splicer							
	Chucktender (wagon, air-track & hydraulic drills)							
	Concrete Laborer (power buggy, concrete saws, pumpcrete nozzleman, vibratorman)							
	Culvert Pipe Laborer							
	Cured Inplace Pipelayer							
	Environmental Laborer (asbestos, marine work)							
	Foam Gun or Foam Machine Operator							

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; ONT=overnight; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other Benefits		THR
Laborers (The area that is south of N63 latitude and west of W138 longitude)								
	**See note on last page if remote site							
						L&M	LEG	
S1202	Group II, including:	30.25	7.24	13.73	1.20	0.20	0.15	52.77
	Green Cutter (dam work)							
	Gunite Operator							
	Hod Carrier							
	Jackhammer or Pavement Breaker (more than 45 pounds)							
	Laser Instrument Operator							
	Laying of Mortarless Decorative Block (retaining walls, flowered decorative block over 4 feet - highway or landscape work)							
	Mason Tender & Mud Mixer (sewer work)							
	Pilot Car							
	Pipelayer Helper							
	Plasterer, Bricklayer & Cement Finisher Tender							
	Powderman Helper							
	Power Saw Operator							
	Railroad Switch Layout Laborer							
	Sandblaster							
	Scaffold Building & Erecting							
	Sewer Caulker							
	Sewer Plant Maintenance Man							
	Thermal Plastic Applicator							
	Timber Faller, Chainsaw Operator, Filer							
	Timberman							
						L&M	LEG	
S1203	Group III, including:	31.15	7.24	13.73	1.20	0.20	0.15	53.67
	Bit Grinder							
	Camera/Tool/Video Operator							
	Guardrail Machine Operator							
	High Rigger & Tree Topper							
	High Scaler							
	Multiplate							
	Plastic Welding							
	Slurry Seal Squeegee Man							
	Traffic Control Supervisor							
	Welding Certified (in connection with laborer's work)							
						L&M	LEG	
S1204	Group IIIA	34.43	7.24	13.73	1.20	0.20	0.15	56.95
	Asphalt Raker, Asphalt Belly Dump Lay Down							
	Drill Doctor (in the field)							
	Driller (including, but not limited to, wagon drills, air-track drills, hydraulic drills)							
	Licensed Powderman							
	Pioneer Drilling & Drilling Off Tugger (all type drills)							
	Pipelayers							

Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other Benefits		THR
Laborers (The area that is south of N63 latitude and west of W138 longitude)								
	**See note on last page if remote site							
						L&M	LEG	
S1205	Group IV	18.82	7.24	13.73	1.20	0.20	0.15	41.34
	Final Building Cleanup							
	Permanent Yard Worker							
						L&M	LEG	
S1206	Group IIIB	35.26	7.24	13.73	1.20	0.20	0.15	57.78
	Federally Licensed Powderman (Responsible Person in Charge)							
	Grade Checking (setting or transferring of grade marks, line and grade)							
Millwrights								
						L&M		
A1251	Millwright (journeyman)	34.99	9.78	9.76	1.00	0.25	0.15	55.93
						L&M		
A1252	Millwright Welder	35.58	9.78	9.76	1.00	0.25	0.15	56.52
Painters, Region I (North of N63 latitude)								
	**See note on last page if remote site							
						L&M		
N1301	Group I, including:	29.85	7.55	11.10	0.83	0.07		49.40
	Brush							
	General Painter							
	Hand Taping							
	Hazardous Material Handler							
	Lead-Based Paint Abatement							
	Roll							
						L&M		
N1302	Group II, including:	30.37	7.55	11.10	0.83	0.07		49.92
	Bridge Painter							
	Epoxy Applicator							
	General Drywall Finisher							
	Hand/Spray Texturing							
	Industrial Coatings Specialist							
	Machine/Automatic Taping							
	Pot Tender							
	Sandblasting							
	Specialty Painter							
	Spray							
	Structural Steel Painter							
	Wallpaper/Vinyl Hanger							
N1304	Group IV, including:	36.16	7.55	10.61	0.80	0.05		55.17
	Glazier							
	Storefront/Automatic Door Mechanic							

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; ONT=overnight; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other Benefits	THR
Painters, Region I (North of N63 latitude)							
	**See note on last page if remote site						
N1305	Group V, including:	29.79	7.55	5.02	0.83	0.07	43.26
	Carpet Installer						
	Floor Coverer						
	Heat Weld/Cove Base						
	Linoleum/Soft Tile Installer						
Painters, Region II (South of N63 latitude)							
	**See note on last page if remote site						
						L&M	
S1301	Group I, including :	28.09	7.55	10.85	0.83	0.07	47.39
	Brush						
	General Painter						
	Hand Taping						
	Hazardous Material Handler						
	Lead-Based Paint Abatement						
	Roll						
	Spray						
						L&M	
S1302	Group II, including :	29.34	7.55	10.85	0.83	0.07	48.64
	General Drywall Finisher						
	Hand/Spray Texturing						
	Machine/Automatic Taping						
	Wallpaper/Vinyl Hanger						
						L&M	
S1303	Group III, including :	29.44	7.55	10.85	0.83	0.07	48.74
	Bridge Painter						
	Epoxy Applicator						
	Industrial Coatings Specialist						
	Pot Tender						
	Sandblasting						
	Specialty Painter						
	Structural Steel Painter						
						L&M	
S1304	Group IV, including:	36.16	7.55	9.86	0.83	0.07	54.47
	Glazier						
	Storefront/Automatic Door Mechanic						
						L&M	
S1305	Group V, including:	29.79	7.55	5.02	0.83	0.07	43.26
	Carpet Installer						
	Floor Coverer						
	Heat Weld/Cove Base						
	Linoleum/Soft Tile Installer						

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; ONT=overnight; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other Benefits		THR
Piledrivers								
	**See note on last page if remote site							
						L&M	IAF	
A1401	Piledriver	36.59	9.78	12.11	0.70	0.10	0.15	59.43
	Assistant Dive Tender							
	Carpenter/Piledriver							
	Rigger							
	Sheet Stabber							
	Skiff Operator							
						L&M	IAF	
A1402	Piledriver-Welder/Toxic Worker	37.59	9.78	12.11	0.70	0.10	0.15	60.43
						L&M	IAF	
A1403	Remotely Operated Vehicle Pilot/Technician	40.90	9.78	12.11	0.70	0.10	0.15	63.74
	Single Atmosphere Suit, Bell or Submersible Pilot							
						L&M	IAF	
A1404	Diver (working) ***See note on last page	80.70	9.78	12.11	0.70	0.10	0.15	103.54
						L&M	IAF	
A1405	Diver (standby) ***See note on last page	40.90	9.78	12.11	0.70	0.10	0.15	63.74
						L&M	IAF	
A1406	Dive Tender ***See note on last page	39.90	9.78	12.11	0.70	0.10	0.15	62.74
						L&M	IAF	
A1407	Welder (American Welding Society, Certified Welding Inspector)	42.15	9.78	12.11	0.70	0.10	0.15	64.99
Plumbers, Region I (North of N63 latitude)								
						L&M	S&L	
N1501	Journeyman Pipefitter	39.96	7.05	12.70	0.95	1.10		61.76
	Plumber							
	Welder							
Plumbers, Region II (South of N63 latitude)								
						L&M		
S1501	Journeyman Pipefitter	38.46	8.42	10.82	1.50	0.20		59.40
	Plumber							
	Welder							
Plumbers, Region IIA (1st Judicial District)								
						L&M		
X1501	Journeyman Pipefitter	36.02	12.22	11.00	2.40	0.24		61.88
	Plumber							
	Welder							
Power Equipment Operators								
	**See note on last page if remote site							

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; ONT=overnight; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other Benefits	THR
	Power Equipment Operators						
	**See note on last page if remote site						
						L&M	
A1601	Group I, including:	38.28	9.10	9.75	1.00	0.10	58.23
	Asphalt Roller: Breakdown, Intermediate, and Finish						
	Back Filler						
	Barrier Machine (Zipper)						
	Beltcrete with Power Pack & similar conveyors						
	Bending Machine						
	Boat Coxswain						
	Bulldozer						
	Cableways, Highlines & Cablecars						
	Cleaning Machine						
	Coating Machine						
	Concrete Hydro Blaster						
	Cranes (45 tons & under or 150 feet of boom & under (including jib & attachments))						
	(a) Hydralifts or Transporters, (all track or truck type)						
	(b) Derricks						
	Crushers						
	Deck Winches, Double Drum						
	Ditching or Trenching Machine (16 inch or over)						
	Drag Scraper, Yarder, and similar types						
	Drilling Machines, Core, Cable, Rotary and Exploration						
	Finishing Machine Operator, Concrete Paving, Laser Screed, Sidewalk, Curb & Gutter Machine						
	Helicopters						
	Hover Craft, Flex Craft, Loadmaster, Air Cushion, All-Terrain Vehicle, Rollagon, Bargecable, Nodwell, & Snow Cat						
	Hydro Ax, Feller Buncher & similar						
	Licensed Line & Grade						
	Loaders (2 1/2 yards through 5 yards, including all attachments):						
	(a) Forklifts (with telescopic boom & swing attachment)						
	(b) Front End & Overhead, (2-1/2 yards through 5 yards)						
	(c) Loaders, (with forks or pipe clamp)						
	(d) Loaders, (elevating belt type, Euclid & similar types)						
	Mechanic, Welder, Bodyman, Electrical, Camp & Maintenance Engineer						
	Micro Tunneling Machine						
	Mixers: Mobile type with hoist combination						
	Motor Patrol Grader						
	Mucking Machine: Mole, Tunnel Drill, Horizontal/Directional Drill Operator and/or Shield						
	Operator on Dredges						
	Piledriver Engineer, L.B. Foster, Puller or similar paving breaker						
	Plant Operator (Asphalt & Concrete)						

Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other Benefits	THR
Power Equipment Operators							
	**See note on last page if remote site						
						L&M	
A1601	Group I, including:	38.28	9.10	9.75	1.00	0.10	58.23
	Power Plant, Turbine Operator 200 k.w & over (power plants or combination of power units over 300 k.w.)						
	Remote Controlled Equipment						
	Scraper (through 40 yards)						
	Service Oiler/Service Engineer						
	Shot Blast Machine						
	Shovels, Backhoes, Excavators with all attachments, and Gradealls (3 yards & under)						
	Sideboom (under 45 tons)						
	Spreaders, Blaw Knox, Cedarapids, Barber Greene, Slurry Machine						
	Sub Grader (Gurries, Reclaimer & similar types)						
	Tack Tractor						
	Truck Mounted Concrete Pump, Conveyor & Creter						
	Unlicensed Off-Road Hauler						
	Wate Kote Machine						
						L&M	
A1602	Group IA, including:	40.04	9.10	9.75	1.00	0.10	59.99
	Camera/Tool/Video Operator (Slipline)						
	Certified Welder, Electrical Mechanic, Camp Maintenance Engineer, Mechanic (over 10,000 hours)						
	Cranes (over 45 tons or 150 feet including jib & attachments)						
	(a) Clamshells & Draglines (over 3 yards)						
	(b) Tower Cranes						
	Licensed Water/Waste Water Treatment Operator						
	Loaders (over 5 yards)						
	Motor Patrol Grader, Dozer, Grade Tractor, Roto-Mill/Profiler (finish: when finishing to final grade and/or to hubs, or for asphalt)						
	Power Plants (1000 k.w. & over)						
	Quad						
	Scrapers (over 40 yards)						
	Screed						
	Shovels, Backhoes, Excavators with all attachments (over 3 yards)						
	Sidebooms (over 45 tons)						
	Slip Form Paver, C.M.I. & similar types						
						L&M	
A1603	Group II, including:	37.51	9.10	9.75	1.00	0.10	57.46
	Boiler - Fireman						
	Cement Hogs & Concrete Pump Operator						
	Conveyors (except those listed in Group I)						
	Hoists on Steel Erection, Towermobiles & Air Tuggers						
	Horizontal/Directional Drill Locator						
	Licensed Grade Technician						

Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other Benefits	THR
Power Equipment Operators							
	**See note on last page if remote site						
						L&M	
A1603	Group II, including:	37.51	9.10	9.75	1.00	0.10	57.46
	Loaders (i.e., Elevating Grader & Material Transfer Vehicle)						
	Locomotives, Rod & Geared Engines						
	Mixers						
	Screening, Washing Plant						
	Sideboom (cradling rock drill, regardless of size)						
	Skidder						
	Trenching Machines (under 16 inches)						
	Water/Waste Water Treatment Operator						
						L&M	
A1604	Group III, including:	36.79	9.10	9.75	1.00	0.10	56.74
	"A" Frame Trucks, Deck Winches						
	Bombardier (tack or tow rig)						
	Boring Machine						
	Brooms, Power						
	Bump Cutter						
	Compressor						
	Farm Tractor						
	Forklift, Industrial Type						
	Gin Truck or Winch Truck (with poles when used for hoisting)						
	Grade Checker & Stake Hopper						
	Hoists, Air Tuggers, Elevators						
	Loaders:						
	(a) Elevating-Athey, Barber Greene & similar types						
	(b) Forklifts or Lumber Carrier (on construction job sites)						
	(c) Forklifts, (with tower)						
	(d) Overhead & Front End, (under 2-l/2 yards)						
	Locomotives: Dinkey (air, steam, gas & electric) Speeders						
	Mechanics, Light Duty						
	Oil, Blower Distribution						
	Posthole Digger, Mechanical						
	Pot Fireman (power agitated)						
	Power Plant, Turbine Operator, (under 200 k.w.)						
	Pumps, Water						
	Roller (other than Asphalt)						
	Saws, Concrete						
	Skid Hustler						
	Skid Steer (with all attachments)						
	Straightening Machine						
	Tow Tractor						
						L&M	
A1605	Group IV, including:	30.58	9.10	9.75	1.00	0.10	50.53
	Crane Assistant Engineer/Rig Oiler						

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Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other Benefits		THR
Power Equipment Operators								
	**See note on last page if remote site							
						L&M		
A1605	Group IV, including:	30.58	9.10	9.75	1.00	0.10		50.53
	Drill Helper							
	Parts & Equipment Coordinator							
	Spotter							
	Steam Cleaner							
	Swamper (on trenching machines or shovel type equipment)							
Roofers								
	**See note on last page if remote site							
						L&M		
A1701	Roofer & Waterproofer	41.45	7.43	2.91	0.81	0.10	0.02	52.72
						L&M		
A1702	Roofer Material Handler	29.02	7.43	2.91	0.81	0.10	0.02	40.29
Sheet Metal Workers, Region I (North of N63 latitude)								
						L&M		
N1801	Sheet Metal Journeyman	44.93	8.30	10.34	1.32	0.25		65.14
	Air Balancing and duct cleaning of HVAC systems							
	Brazing, soldering or welding of metals							
	Demolition of sheet metal HVAC systems							
	Fabrication and installation of exterior wall sheathing, siding, metal roofing, flashing, decking and architectural sheet metal work							
	Fabrication and installation of heating, ventilation and air conditioning ducts and equipment							
	Fabrication and installation of louvers and hoods							
	Fabrication and installation of sheet metal lagging							
	Fabrication and installation of stainless steel commercial or industrial food service equipment							
	Manufacture, fabrication assembly, installation and alteration of all ferrous and nonferrous metal work							
	Metal lavatory partitions							
	Preparation of drawings taken from architectural and engineering plans required for fabrication and erection of sheet metal work							
	Sheet Metal shelving							
	Sheet Metal venting, chimneys and breaching							
	Skylight installation							
Sheet Metal Workers, Region II (South of N63 latitude)								
						L&M		
S1801	Sheet Metal Journeyman	39.99	8.30	11.20	1.10	0.33		60.92
	Air Balancing and duct cleaning of HVAC systems							
	Brazing, soldering or welding of metals							

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; ONT=overnight; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other Benefits	THR
Sheet Metal Workers, Region II (South of N63 latitude)							
						L&M	
S1801	Sheet Metal Journeyman	39.99	8.30	11.20	1.10	0.33	60.92
	Demolition of sheet metal HVAC systems						
	Fabrication and installation of exterior wall sheathing, siding, metal roofing, flashing, decking and architectural sheet metal work						
	Fabrication and installation of heating, ventilation and air conditioning ducts and equipment						
	Fabrication and installation of louvers and hoods						
	Fabrication and installation of sheet metal lagging						
	Fabrication and installation of stainless steel commercial or industrial food service equipment						
	Manufacture, fabrication assembly, installation and alteration of all ferrous and nonferrous metal work						
	Metal lavatory partitions						
	Preparation of drawings taken from architectural and engineering plans required for fabrication and erection of sheet metal work						
	Sheet Metal shelving						
	Sheet Metal venting, chimneys and breaching						
	Skylight installation						
Sprinkler Fitters							
						L&M	
A1901	Sprinkler Fitter	42.05	8.42	12.80	0.45	0.25	63.97
Surveyors							
	**See note on last page if remote site						
						L&M	
A2001	Chief of Parties	42.11	7.38	9.99	1.20	0.10	60.78
						L&M	
A2002	Party Chief	40.52	7.38	9.99	1.20	0.10	59.19
						L&M	
A2003	Line & Grade Technician/Office Technician	39.92	7.38	9.99	1.20	0.10	58.59
						L&M	
A2004	Associate Party Chief (including Instrument Person & Head Chain Person)	37.80	7.38	9.99	1.20	0.10	56.47
						L&M	
A2005	Stake Hop/Grademan	34.87	7.38	9.99	1.20	0.10	53.54
						L&M	
A2006	Chain Person (for crews with more than 2 people)	33.46	7.38	9.99	1.20	0.10	52.13
Truck Drivers							
	**See note on last page if remote site						
						L&M	
A2101	Group I, including:	38.89	7.38	9.99	1.20	0.10	57.56
	Air/Sea Traffic Controllers						

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; ONT=overnight; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other Benefits	THR
Truck Drivers							
	**See note on last page if remote site						
						L&M	
A2101	Group I, including:	38.89	7.38	9.99	1.20	0.10	57.56
	Ambulance/Fire Truck Driver (EMT certified)						
	Boat Coxswain						
	Captains & Pilots (air & water)						
	Deltas, Commanders, Rollagons, & similar equipment (when pulling sleds, trailers or similar equipment)						
	Dump Trucks (including rockbuggy & trucks with pups) over 40 yards up to & including 60 yards						
	Helicopter Transporter						
	Lowboys, including attached trailers & jeeps, up to & including 12 axles (over 12 axles or 150 tons to be negotiated)						
	Material Coordinator and Purchasing Agent						
	Ready-mix (over 12 yards up to & including 15 yards) (over 15 yards to be negotiated)						
	Semi with Double Box Mixer						
	Tireman, Heavy Duty/Fueler						
	Water Wagon (250 Bbls and above)						
						L&M	
A2102	Group 1A including:	40.16	7.38	9.99	1.20	0.10	58.83
	Dump Trucks (including rockbuggy & trucks with pups) over 60 yards up to & including 100 yards (over 100 yards to be negotiated)						
	Jeeps (driver under load)						
						L&M	
A2103	Group II, including:	37.63	7.38	9.99	1.20	0.10	56.30
	All Deltas, Commanders, Rollagons, & similar equipment						
	Construction and Material Safety Technician						
	Dump Trucks (including rockbuggy & trucks with pups) over 20 yards up to & including 40 yards						
	Lowboys (including attached trailers & jeeps up to & including 8 axles)						
	Mechanics						
	Partsman						
	Ready-mix (over 7 yards up to & including 12 yards)						
	Stringing Truck						
	Super Vac Truck/Cacasco Truck/Heat Stress Truck						
	Turn-O-Wagon or DW-10 (not self loading)						
						L&M	
A2104	Group III, including:	36.81	7.38	9.99	1.20	0.10	55.48
	Batch Trucks (8 yards & up)						
	Dump Trucks (including rockbuggy & trucks with pups) over 10 yards up to & including 20 yards						
	Expeditor (electrical & pipefitting materials)						
	Greaser - Shop						
	Oil Distributor Driver						
	Thermal Plastic Layout Technician						

Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other Benefits	THR
Truck Drivers							
	**See note on last page if remote site						
						L&M	
A2104	Group III, including:	36.81	7.38	9.99	1.20	0.10	55.48
	Traffic Control Technician						
	Trucks/Jeeps (push or pull)						
						L&M	
A2105	Group IV, including:	36.23	7.38	9.99	1.20	0.10	54.90
	Air Cushion or similar type vehicle						
	All Terrain Vehicle						
	Boom Truck/Knuckle Truck (over 5 tons)						
	Buggymobile						
	Bull Lift & Fork Lift, Fork Lift with Power Boom & Swing Attachment (over 5 tons)						
	Bus Operator (over 30 passengers)						
	Combination Truck-Fuel & Grease						
	Compactor (when pulled by rubber tired equipment)						
	Dump Trucks (including Rockbuggy & trucks with pups up to & including 10 yards)						
	Dumpster						
	Expeditor (general)						
	Fire Truck/Ambulance Driver						
	Flat Beds, Dual Rear Axle						
	Foam Distributor Truck Dual Axle						
	Front End Loader with Fork						
	Gin Pole Truck, Winch Truck, Wrecker (truck mounted "A" frame manufactured rating over 5 tons)						
	Grease Truck						
	Hydro Seeder, Dual Axle						
	Hyster Operators (handling bulk aggregate)						
	Loadmaster (air & water operations)						
	Lumber Carrier						
	Ready-mix, (up to & including 7 yards)						
	Rigger (air/water/oilfield)						
	Semi or Truck & Trailer						
	Tireman, Light Duty						
	Track Truck Equipment						
	Vacuum Truck, Truck Vacuum Sweeper						
	Warehouseperson						
	Water Truck, Dual Axle						
	Water Wagon, Semi						
						L&M	
A2106	Group V, including:	35.47	7.38	9.99	1.20	0.10	54.14
	Batch Truck (up to & including 7 yards)						
	Boom Truck/Knuckle Truck (up to & including 5 tons)						
	Buffer Truck						

Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other Benefits	THR
Truck Drivers							
	**See note on last page if remote site						
						L&M	
A2106	Group V, including:	35.47	7.38	9.99	1.20	0.10	54.14
	Bull Lifts & Fork Lifts, Fork Lifts with Power Boom & Swing Attachments (up to & including 5 tons)						
	Bus Operator (up to 30 passengers)						
	Farm Type Rubber Tired Tractor (when material handling or pulling wagons on a construction project)						
	Flat Beds, Single Rear Axle						
	Foam Distributor Truck Single Axle						
	Fuel Handler (station/bulk attendant)						
	Gear/Supply Truck						
	Gin Pole Truck, Winch Truck, Wrecker (truck mounted "A" frame manufactured rating 5 tons & under)						
	Gravel Spreader Box Operator on Truck						
	Hydro Seeders, Single axle						
	Pickups (pilot cars & all light-duty vehicles)						
	Rigger/Swamper						
	Tack Truck						
	Team Drivers (horses, mules, & similar equipment)						
	Water Truck (Below 250 Bbls)						
Tunnel Workers, Laborers (The Alaska areas north of N63 latitude and east of W138 longitude)							
	**See note on last page if remote site						
						L&M	LEG	
N2201	Group I, including:	32.18	7.24	13.73	1.20	0.20	0.15	54.70
	Brakeman							
	Mucker							
	Nipper							
	Topman & Bull Gang							
	Tunnel Track Laborer							
						L&M	LEG	
N2202	Group II, including:	33.28	7.24	13.73	1.20	0.20	0.15	55.80
	Burning & Cutting Torch							
	Concrete Laborer							
	Jackhammer							
	Laser Instrument Operator							
	Nozzlemen, Pumpcrete or Shotcrete							
	Pipelayer Helper							
						L&M	LEG	
N2203	Group III, including:	34.27	7.24	13.73	1.20	0.20	0.15	56.79
	Miner							
	Retimberman							
						L&M	LEG	
N2204	Group IIIA, including:	37.87	7.24	13.73	1.20	0.20	0.15	60.39

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; ONT=overnight; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other Benefits		THR
Tunnel Workers, Laborers (The Alaska areas north of N63 latitude and east of W138 longitude)								
	**See note on last page if remote site							
						L&M	LEG	
N2204	Group IIIA, including:	37.87	7.24	13.73	1.20	0.20	0.15	60.39
	Asphalt Raker, Asphalt Belly Dump Lay Down							
	Drill Doctor (in the field)							
	Driller (including, but not limited to wagon drills, air-track drills, hydraulic drills)							
	Licensed Powderman							
	Pioneer Drilling & Drilling Off Tugger (all type drills)							
	Pipelayer							
						L&M	LEG	
N2206	Group IIIB, including:	38.79	7.24	13.73	1.20	0.20	0.15	61.31
	Federally Licensed Powderman (Responsible Person in Charge)							
	Grade Checking (setting or transferring of grade marks, line and grade)							
Tunnel Workers, Laborers (The area that is south of N63 latitude and west of W138 longitude)								
	**See note on last page if remote site							
						L&M	LEG	
S2201	Group I, including:	32.18	7.24	13.73	1.20	0.20	0.15	54.70
	Brakeman							
	Mucker							
	Nipper							
	Topman & Bull Gang							
	Tunnel Track Laborer							
						L&M	LEG	
S2202	Group II, including:	33.28	7.24	13.73	1.20	0.20	0.15	55.80
	Burning & Cutting Torch							
	Concrete Laborer							
	Jackhammer							
	Laser Instrument Operator							
	Nozzlemen, Pumpcrete or Shotcrete							
	Pipelayer Helper							
						L&M	LEG	
S2203	Group III, including:	34.27	7.24	13.73	1.20	0.20	0.15	56.79
	Miner							
	Retimberman							
						L&M	LEG	
S2204	Group IIIA, including:	37.87	7.24	13.73	1.20	0.20	0.15	60.39
	Asphalt Raker, Asphalt Belly Dump Lay Down							
	Drill Doctor (in the field)							
	Driller (including, but not limited to wagon drills, air-track drills, hydraulic drills)							
	Licensed Powderman							
	Pioneer Drilling & Drilling Off Tugger (all type drills)							
	Pipelayer							

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; ONT=overnight; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other Benefits		THR
						L&M	LEG	
Tunnel Workers, Laborers (The area that is south of N63 latitude and west of W138 longitude)								
	**See note on last page if remote site							
S2206	Group IIIB, including:	38.79	7.24	13.73	1.20	0.20	0.15	61.31
	Federally Licensed Powderman (Responsible Person in Charge)							
	Grade Checking (setting or transferring of grade marks, line and grade)							
Tunnel Workers, Power Equipment Operators								
	**See note on last page if remote site							
						L&M		
A2207	Group I	42.11	9.10	9.75	1.00	0.10		62.06
						L&M		
A2208	Group IA	44.04	9.10	9.75	1.00	0.10		63.99
						L&M		
A2209	Group II	41.26	9.10	9.75	1.00	0.10		61.21
						L&M		
A2210	Group III	40.47	9.10	9.75	1.00	0.10		60.42
						L&M		
A2211	Group IV	33.64	9.10	9.75	1.00	0.10		53.59

*** A remote site is isolated and relatively distant from the amenities of civilization, and usually far from the employee's home. As a condition of employment, the workers must eat, sleep, and socialize at the worksite and remain there for extended periods.**

**** This classification must receive board and lodging under certain conditions. A per diem option of $75 is an alternative to providing meals and lodging. See Page v for an explanation.**

***** Work in combination of classifications: Employees working in any combination of classifications within the diving crew (working diver, standby diver, and tender) in a shift are paid in the classification with the highest rate for a minimum of 8 hours per shift.**

Part 5

TECHNICAL SPECIFICATIONS

TABLE OF CONTENTS

DIVISION 8 - DOORS AND WINDOWS

DIVISION 9 - FINISHES

DIVISION 10 - SPECIALTIES

DIVISION 12 - FURNISHINGS

DIVISION 13 - SPECIAL CONSTRUCTION

DIVISION 15 - MECHANICAL

DIVISION 16 - ELECTRICAL

SECTION 01100
SUMMARY

PART 1 GENERAL

1.01 PROJECT

A. Project Name: Unalaska Pyramid WTP - LT2 Upgrade.

B. Owner's Name: City of Unalaska.

C. Engineer's Name: Owner's representative.

D. The Project consists of the construction of a new Water treatment plant to meet USEPA's Long Term 2 Surface Water Treatment Rule (LT2). This includes a pre-manufactured metal building, associated piping and appurtenances, site work and grading, construction of a discharge header and all work necessary for a complete and operable Water Treatment Plant as defined in these contract documents.

1.02 CONTRACT DESCRIPTION

A. Contract Type: A single prime contract based on a lump sum as described in the General Conditions.

1.03 DESCRIPTION OF ALTERATIONS WORK

A. Scope of demolition and removal work is shown on drawings or as described in these specifications.

B. If any part of these specifications conflict with Part 3 - General Conditions, the General Conditions will take precedence.

1.04 OWNER OCCUPANCY

A. Owner intends to occupy the Project upon Substantial Completion.

B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

C. Schedule the Work to accommodate Owner occupancy.

1.05 CONTRACTOR USE OF SITE AND PREMISES

A. Construction Operations: Limited to areas noted on Drawings. Obtain written permission for any use of private property outside the construction limits.

B. Arrange use of site and premises to allow:
   1. Work by Others.
   2. Work by Owner.

C. Provide access to and from site as required by law and by Owner:
   1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
   2. Do not obstruct roadways, sidewalks, or other public ways without permit.

D. Have a Foreman or Superintendent present on site any time work is being performed. Each Contractor or Sub-Contractor shall have at least one English speaking representative on site while work is being performed.

E. Except as specifically noted, provide and pay for:
   1. Labor, materials, equipment, and all transportation.
   2. Tools, construction equipment and machinery.
   3. Other facilities and services necessary for proper execution and completion of work.

F. Pay legally required sales, consumer, and city sale taxes.

G. Secure and pay for, as necessary for proper execution and completion of work, and as applicable at time of receipt of bids:
   1. Government fees.
   2. Licenses.

H. Maintain the original or a copy of all necessary permits and licenses at the project site.

I. Give required notices.

J. Comply with codes, ordinances, rules, regulations, orders and other legal requirements of public authorities which bear on performance of work.

K. Promptly submit written notice to Owners Representative of observed variance of Contract Documents from legal requirements.
   1. Appropriate Modifications to Contract Documents will adjust necessary changes.
   2. Assume responsibility for work known to be contrary to such requirements that is completed without notice.

L. Enforce strict discipline and good order among employees. Do not employ on work:
   1. Unfit persons.
   2. Persons not skilled in assigned task.

M. Utility Outages and Shutdown:
   1. Limit shutdown of utility services to 4 hours at a time during business hours, arranged at least 72 hours in advance with Owner.
   2. Owner has right of rufusal for any outages or shutdowns
   3. Prevent accidental disruption of utility services to other facilities.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01300
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electronic document submittal service.

B. Preconstruction meeting.

C. Progress meetings.

D. Construction progress schedule.

E. Submittals for review, information, and project closeout.

F. Number of copies of submittals.

G. Submittal procedures.

H. When required by the specifications, the Contractor shall submit descriptive information, which will enable the Owner's Representative to evaluate, whether the Contractor's proposed materials, equipment, or methods of work are in compliance with the Contract Documents. The information submitted shall consist of drawings, specifications, descriptive data, certificates, samples, test results, and other information specified herein.

1.02 CONTRACTOR'S RESPONSIBILITIES

A. The Contractor shall be responsible for the accuracy and completeness of the information contained in each submittal and shall assure that the material, equipment, or method of work shall be as described in the submittal.

B. The Contractor shall verify that the material and equipment described in each submittal conforms to the requirements of the specifications and contract drawings. If the information shows deviations from the specifications or contract drawings the Contractor shall, by written statement accompanying the information, identify the deviations and state the reason therefor.

C. The Contractor shall ensure that his submittals have no conflict with other submittals and notify the Owner's Representative in each case where his submittal may affect the work of others.

D. The Contractor shall be responsible for the coordination of submittals by the subcontractors.

E. Submittals shall be made in a timely manner to allow review by the Owner's Representative. Work performed by the Contractor without accepted submittals related to such work shall be considered as having been performed by the Contractor at his own risk. If related submittals are found not acceptable, the Contractor shall remove or correct work related to such unacceptable submittals, to the satisfaction of the Owner's Representative.

F. Where applicable, submittals shall be stamped by an engineer registered in the appropriate discipline by the State of Alaska.

1.03 TRANSMITTAL PROCEDURE

A. General:
   1. Submittals regarding material and equipment shall be accompanied by a transmittal form. A separate form shall be used for each item, class of material, piece of equipment specified in separate sections for which the submittal is required. Submittals for several items shall be made with a single form when the items together constitute a manufacturer's package or are so functionally related that the expediency indicates checking or review of the group or package as a whole.
   2. A unique number, sequentially assigned, shall be noted on the transmittal form accompanying each item submitted and will include the relevant specification section number.
   3. Contractor shall coordinate submittal tracking with Owners Representative and indicate with each transmittal the urgency and/or the priority of the request.

B. Deviation from Contract: If the Contractor proposes to provide material or equipment which does not conform to the specifications and contract drawings, he shall indicate so on the transmittal form accompanying the submittal. He shall explain the reason for the change, shall include cost differential, and shall request a change order to cover the deviation.

C. Submittal Completeness: Submittals, which do not have adequate information, are not acceptable and will be returned without review.

1.04 REVIEW PROCEDURE

A. Within 14 days after receipt of the submittal, the Owner's Representative will review the submittal and return the marked-up reproducible original, unless otherwise specified.

B. The returned submittal will indicate one of the following actions:
   1. If the review indicates that the material, equipment, or work method is in general conformance with the design concept and complies with the contract drawing and specifications, the submitted copies will be marked "NO EXCEPTIONS TAKEN". In this event the Contractor may begin to implement the work method or incorporate the material or equipment covered by the submittal.
   2. If the review indicates that the submittal is insufficient or that limited corrections are required, the submittal copies will be marked "REVISE AS NOTED". The contractor may begin implementing the work method or incorporating the material or equipment covered by the submittal, in accordance with the noted corrections. Where submittal information will be incorporated in operation and maintenance data, a corrected copy shall be provided within 30 days, otherwise no further action will be required.
   3. If the review reveals that the submittal is insufficient or contains incorrect data, the submittal copies will be marked "REVISE AND RESUBMIT".
   4. If the submittal is incomplete or does not comply with the Contract Drawings and Specifications, the submittal copies will be marked "NOT REVIEWED". In this event, the Contractor must resubmit the proper material, equipment and work method in general conformance with the Contract Drawings and Specifications. Except at his own risk, the Contractor shall not undertake work covered by this submittal until the attached comments have been revised, resubmitted, and returned marked either "NO EXCEPTIONS TAKEN".

1.05 EFFECT OF REVIEW OF CONTRACTOR'S SUBMITTALS

A. Review of drawings, methods of work, or information regarding materials or equipment the Contractor proposes to provide shall not relieve Contractor of his responsibility for error therein and for failure to comply with the Contract Drawings and Specifications and shall not be regarded as an assumption of risks or liability by the Owner's Representative, by the Owner, or by any officer, employee or consultant of the Owner. Contractor shall have no claim under the Contract because of the failure, or partial failure, of the method of work, material, or equipment so reviewed. A mark of "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED" shall mean that the Owner has no objection to the Contractor using the plan or method of work proposed, or providing the materials or equipment proposed.
   1. The document shall be organized by specification section number and shall include the following information for all listed items:
      a. Submittal numbers.
      b. Proposed submittal date.
      c. Project review and acceptance dates.
   2. The document shall provide adequate time allowance for review and acceptance by the Owner's Representative and by others when required.

1.06 PRODUCT OPTIONS

A. The contract is based on standards of quality established in the Contract Documents.
   1. In agreeing to the terms and conditions of the Contract, the Contractor has accepted a responsibility to verify that the specified products will be available and to place orders for all required materials in such a timely manner as is needed to meet his agreed construction schedule.

2. Neither the Owner nor the Owner's Representative has agreed to the substitution of materials or methods called for the Contract Documents, except as they may specifically otherwise state in writing.

B. Materials and/or methods specified by name:
   1. Where materials and/or methods are specified by naming one single manufacturer and/or model number, without stating that equal products will be considered, only the material and/or method named is approved for incorporation into the work.
   2. Should the Contractor demonstrate to the approval of the Owner's Representative that a specified material or method was ordered in a timely manner and will not be available in time for incorporation into this work, the Contractor shall submit to the Owner's Representative such data on proposed substitute materials and/or methods as are needed to help the Owner's Representative determine suitability of the proposed substitution.

C. Where materials and/or methods are specified by name and/or model number, followed by the words "or an approved equal".
   1. The material and/or method specified by name establishes the required standard of quality.
   2. Materials and/or methods proposed by the Contractor to be used in lieu of materials and/or methods so specified by name shall in all ways equal or exceed the qualities of the named materials and/or methods.

D. Where the phrase "or equal" or "equal as approved by the Owner's Representative" occurs in the Contract Documents, do not assume that the materials, equipment, or methods will be approved as equal unless the item has been specifically so approved for this work by the Owner's Representative.

E. The decision of the Owner's Representative shall be final.

1.07 REIMBURSEMENT OF OWNER'S REPRESENTATIVE'S COST

A. In the event substitutions are proposed to the Owner's Representative after the Contract has been awarded, the Owner's Representative will record all time used by the Owner's Representative's and consultants in evaluating each such proposed substitution.

1.08 DELAYS

A. Delays in construction arising by virtue of the non-availability of a specified material and/or method will not be considered by the Owner's Representative as justifying an extension of the agreed time of completion.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF) format with electronic stamping and signatures and transmitted via email or an alternate method approved by Owners Representative.
   1. Besides submittals for review, information, and closeout, this procedure applies to requests for information (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, and any other document any participant wishes to make part of the project record.
   2. Contractor and Owner's representative are required to use this service.
   3. It is Contractor's responsibility to submit documents in PDF format.
   4. Paper document transmittals will not be reviewed; emailed PDF documents that are not electronically signed will not be reviewed.
   5. All other specified submittal and document transmission procedures apply, except that electronic document requirements to not apply to samples or color selection charts.

B. Project Closeout: Owner's representative will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for Owner.

3.02 PRECONSTRUCTION MEETING

A. Owner will schedule a meeting after Notice of Award.

B. Attendance Required in person at the Department of Public Works in Unalaska:
   1. Owner.
   2. Owner's representative.
   3. Contractor Project Manager.
   4. Contractor Superintendant.

C. Agenda:
   1. Execution of Owner- Contractor Agreement.
   2. Submission of executed bonds and insurance certificates.
   3. Distribution of Contract Documents.
   4. Submission of list of Subcontractors, list of Products, schedule of values, and progress schedule.
   5. Designation of personnel representing the parties to Contract, Owner and Owner's representative.
   6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
   7. Project scheduling.

3.03 PROGRESS MEETINGS

A. The Owner will schedule and administer meetings throughout progress of the Work at maximum weekly intervals.

B. The Owners Representative will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. Attendance Required: Job superintendent, Owner, Owner's representative, as appropriate to agenda topics for each meeting.

D. Agenda:
   1. Review minutes of previous meetings.
   2. Review of Work progress.
   3. Field observations, problems, and decisions.
   4. Safety
   5. Pending service interruptions
   6. Identification of problems that impede, or will impede, planned progress.
   7. Review of submittals schedule and status of submittals.
   8. Review of off-site fabrication and delivery schedules.
   9. Maintenance of progress schedule.
   10. RFI's
   11. Change orders
   12. Corrective measures to regain projected schedules.
   13. Planned progress during succeeding work period.
   14. Coordination of projected progress.
   15. Maintenance of quality and work standards.
   16. Effect of proposed changes on progress schedule and coordination.
   17. Other business relating to Work.

3.04 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
   1. Product data.
   2. Shop drawings.
   3. Samples for selection.
   4. Samples for verification.

B. Submit to Owner's representative for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.

C. Samples will be reviewed only for aesthetic, color, or finish selection.

3.05 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
   1. Design data.
   2. Certificates.
   3. Test reports.
   4. Inspection reports.
   5. Manufacturer's instructions.
   6. Other types indicated.

3.06 SUBMITTALS FOR PROJECT CLOSEOUT

A. When the following are specified in individual sections, submit them at project closeout:
   1. Project record documents.
   2. Operation and maintenance data.
   3. Warranties.
   4. Bonds.
   5. Other types as indicated.

3.07 NUMBER OF COPIES OF SUBMITTALS

A. Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

B. Submittals should be delivered electronically with the exception of samples.

C. Documents for Project Closeout: Make one reproduction of submittal originally reviewed. Submit one extra of submittals for information.

D. Samples: Submit the number specified in individual specification sections; one of which will be retained by Owner's representative.
   1. Retained samples will not be returned to Contractor unless specifically so stated.
   2. Certificates: Certificates will be acknowledged. No copy will be returned.

3.08 SUBMITTAL PROCEDURES

A. Transmit each submittal with approved form.

B. Sequentially number the transmittal form and include on all pages of the submittal. Revise submittals with original number and a sequential alphabetic suffix and will include relevant specification section numbers.

C. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy. Delete, cross out, or otherwise make clear any information that is not applicable to the project.

D. Provide an MSDS (Material Safety Data Sheet) for each product as required. A MSDS log shall be electronically maintained by the contractor and available to the owner at all times throughout the project.

E. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.

F. Schedule submittals to expedite the Project, and coordinate submission of related items.

G. For each submittal for review, allow 14 days to and from the Contractor.

H. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.

I. Provide space for Contractor and Owner's representative review stamps.

J. When revised for resubmission, identify all changes made since previous submission.

K. Distribute reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.

END OF SECTION

SECTION 01325
CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preliminary schedule.

B. Construction progress schedule, bar chart type.

1.02 REFERENCES

A. AGC (CPSM) - Construction Planning and Scheduling Manual; Associated General Contractors of America; 2004.

B. M-H (CPM) - CPM in Construction Management - Project Management with CPM, O'Brien, McGraw-Hill Book Company; 2006.

1.03 SUBMITTALS

A. According to Section 6.6 of the General Conditions, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.

B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

C. Within 20 days after review of preliminary schedule and prior to the first application for payment, submit draft of proposed complete schedule for review.
   1. Include written certification that major contractors have reviewed and accepted proposed schedule.

D. Within 10 days after joint review, submit complete schedule.

E. Submit updated schedule with each Application for Payment.

F. Submit under transmittal letter form specified in Section 01300.

G. See General Conditions 6.6 and 6.7

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRELIMINARY SCHEDULE

A. Prepare preliminary schedule in the form of a horizontal bar chart.

3.02 CONTENT

A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.

B. Identify each item by specification section number.

C. Identify work of separate stages and other logically grouped activities.

D. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.

E. Provide legend for symbols and abbreviations used.

3.03 BAR CHARTS

A. Include a separate bar for each major portion of Work or operation.

B. Identify the first work day of each week.

3.04 UPDATING SCHEDULE

A. Maintain schedules to record actual start and finish dates of completed activities.

B. Indicate progress of each activity to date of revision, with projected completion date of each activity.

C. Annotate diagrams to graphically depict current status of Work.

D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.

E. Indicate changes required to maintain Date of Substantial Completion.

F. Submit reports required to support recommended changes.

3.05 SCHEDULE DEVIATION

A. Deviation in schedule of 10 days shall be supported with necessary documentation and the owner shall be notified of each occurrence.

B. Any deviation in schedule, regardless of approval by the owner, that changes the final completion date does not alleviate the contractor of their initial closeout date and the owner may still apply the appropriate damages or cost associated with such delays.

END OF SECTION

SECTION 01370
SCHEDULE OF VALUES

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. Submit to Owner's Representative a Schedule of Values, in accordance with General Conditions 6.6 and 6.7.

B. Upon request by Contracting Officer, support values given with data that will substantiate their correctness.

C. Submit quantities of stored or other designated materials.

D. List quantities of materials specified under unit price allowances.

E. Payment for materials stored will be limited to those materials supported by invoice per 1.04 below.

1.02 FORM OF SUBMITTAL

A. Submit typewritten Schedule of Values on a form provided by Contracting Officer.

B. Use Table of Contents of this Specification as basis for format for listing costs of work for SECTIONS under Divisions 2 through 16.

C. Identify each line item with number and title as listed in Table of Contents of this Specification.

1.03 PREPARING SCHEDULE OF VALUES

A. Itemize separate line item cost for each of following general cost items:
   1. Performance and Payment Bonds.
   2. Field Supervision and Layout.
   3. Temporary Facilities and Controls.
   4. Insurance.

B. Itemize separate line item cost for work required by each section of this Specification.

C. Round off figures to nearest dollar.

D. Make sum of total costs of all items listed in Schedule equal to total Contract Sum.

E. Include in each line item a directly proportional amount of Contractor's overhead and profit.

F. Revise schedule to list Change Orders for each application for payment.

1.04 PREPARING SCHEDULE OF STORED MATERIALS

A. Submit separate recap for all stored materials which are included in the schedule.

B. The Contractor shall request approval from the Contracting Officer of any location for stored materials other than the construction site, prior to submittal of Application for Payment.

C. Materials shall be stored within 50 miles of the construction site.

D. All stored materials listed on recap shall be substantiated by invoices for the material and copies of the invoices shall be attached to the recap. If any stored materials are being claimed which are not stored on the construction site, itemized listing shall show location where materials are stored and such location must be available for inspection of the materials.

E. Contractor must show proof of adequate insurance for materials stored off- site.

F. Stored material prices shall include cost of material, related freight costs and applicable taxes. All of which must be substantiated by invoice.

END OF SECTION

SECTION 01400
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. References and standards.

B. Quality assurance submittals.

C. Control of installation.

D. Tolerances.

E. Testing and inspection services.

1.02 RELATED REQUIREMENTS

A. Document 00300 - Bid Forms

B. Part 3 - General Conditions

C. Section 01300 - Administrative Requirements: Submittal procedures.

1.03 REFERENCE STANDARDS

A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008.

B. ASTM C1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation; 2013a.

C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2012.

D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2012a.

E. ASTM E329 - Standard Specification for Agencies Engaged Construction Inspection and/or Testing; 2011.

F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2009.

G. IAS AC89 - Accreditation Criteria for Testing Laboratories; 2010.

1.04 SUBMITTALS

A. Design Data: Submit for Owner's representative's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Owner's information.

B. Test Reports: After each test/inspection, promptly submit two copies of report to Owner's representative and to Contractor.
   1. Include:
      a. Date issued.
      b. Project title and number.
      c. Name of inspector.
      d. Date and time of sampling or inspection.
      e. Identification of product and specifications section.
      f. Location in the Project.
      g. Type of test/inspection.
      h. Date of test/inspection.
      i. Results of test/inspection.
      j. Conformance with Contract Documents.
      k. When requested by Owner's representative, provide interpretation of results.
   2. Test report submittals are for Owner's representative's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Owner's information.

C. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Owner's representative, in quantities specified for Product Data.
   1. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
   2. Certificates may be recent or previous test results on material or product, but must be acceptable to Owner's representative.

D. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

E. Manufacturer's Field Reports: Submit reports for Owner's representative's benefit as contract administrator or for Owner.
   1. Submit report in duplicate within 30 days of observation to Owner's representative for information.
   2. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Owner's representative before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have Work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Owner's representative before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

3.03 TESTING AND INSPECTION

A. Testing Agency Duties:
   1. Provide qualified personnel at site. Cooperate with Owner's representative and Contractor in performance of services.
   2. Perform specified sampling and testing of products in accordance with specified standards.
   3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
   4. Promptly notify Owner's representative and Contractor of observed irregularities or non-conformance of Work or products.
   5. Perform additional tests and inspections required by Owner's representative.

6. Submit reports of all tests/inspections specified.

B. Limits on Testing/Inspection Agency Authority:
   1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
   2. Agency may not approve or accept any portion of the Work.
   3. Agency may not assume any duties of Contractor.
   4. Agency has no authority to stop the Work.

C. Contractor Responsibilities:
   1. Deliver to testing agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
   2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
   3. Provide incidental labor and facilities:
      a. To provide access to Work to be tested/inspected.
      b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
      c. To facilitate tests/inspections.
      d. To provide storage and curing of test samples.
   4. Notify Owner's representative and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
   5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

D. Re-testing required because of non-conformance to specified requirements shall be performed by the same testing agency on instructions by Owner's representative.

E. Re-testing required because of non-conformance to specified requirements shall be paid for by Contractor.

3.04 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not conforming to specified requirements.

B. If, in the opinion of Owner's representative, it is not practical to remove and replace the Work, Owner's representative will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 01500
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary utilities.

B. Temporary telecommunications services.

C. Temporary sanitary facilities.

D. Temporary Controls: Barriers, enclosures, and fencing.

E. Security requirements.

F. Vehicular access and parking.

G. Waste removal facilities and services.

1.02 RELATED REQUIREMENTS

A. Section 01510 - Temporary Utilities.

B. Section 01732 - Waste Management

1.03 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

B. Maintain daily in clean and sanitary condition.

C. Temporary facilities must be properly secured.

1.04 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.

C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.06 WASTE REMOVAL

A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

B. Provide containers with lids. Remove trash from site periodically.

C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

E. The Contractor shall provide and pay for all landfill waste disposal fees.

1.07 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Substantial Completion inspection.

B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing facilities used during construction to original condition.

E. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01510
TEMPORARY UTILITIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary Utilities: Electricity, lighting, heat, ventilation, and water.

1.02 RELATED REQUIREMENTS

A. Section 01500 - Temporary Facilities and Controls:

B. Division 16 of these specifications.

1.03 TEMPORARY ELECTRICITY

A. Owner will only provide a meter for temporary power and terminate Contractor installed conductors at the transformer. The Contractor shall provide, at their own expense, all other work including, meter base, trenching, conduit, fusible disconnect etc. Owner shall pay reasonable electrical costs up to 200 amps. Contractor must apply for power at the Department of Public Works using a "Utility Service Request" form.

B. Provide temporary underground electric feeder.

C. Power Service Characteristics: one or three phase.

D. Provide power outlets for construction operations, with branch wiring and distribution boxes located as required. Provide flexible power cords as required. All outlets shall be GFCI protected.

E. Provide main service disconnect and over-current protection at convenient location and meter.

F. Permanent convenience receptacles may be utilized during construction.

G. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.

1.04 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

A. Provide and maintain incandescent lighting for construction operations to achieve a minimum lighting level of 2 watt/sq ft.

B. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.

C. Maintain lighting and provide routine repairs.

1.05 TEMPORARY HEATING

A. Provide heating devices and heat interior areas as needed to maintain specified conditions for construction operations.

B. Maintain minimum ambient temperature of 50 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

1.06 TEMPORARY WATER SERVICE

A. Connect to existing water source.
   1. Exercise measures to conserve water.
   2. Provide approved metering and reimburse Owner for cost of water used.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01575
EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.01 SUMMARY

A. The Work will fall under the ACGP as it is a publically owned construction project which will impact at least 1 acre.

B. Section includes performance specifications of the materials and methods for controlling erosion, sedimentation, discharge of storm and construction dewatering water, fugitive dust, and fugitive gas during the Work.

C. The cost of implementation of the ACGP into the Work, BMP structures employed by the Contractor but not listed in this Specification, construction dewatering, and water filtration are considered incidental to the Work and no separate payment or additional compensation will be made for them.

1.02 REFERENCES

A. The publications listed herein form part of this Specification to the extent applicable. The publications are referred to in the text by basic designation only. The most recent version of the publication shall be applicable in all cases. Refer to the ADEC Division of Water website for application instructions and ADEC references:

http://dec.alaska.gov/WATER/wnpspc/stormwater/index.htm

1. ADEC Alaska Construction General Permit AKR100000
2. ADEC ACGP Permit No. AKR100000 Fact Sheet
3. ADEC ACGP SWPPP Template
4. ADEC ACGP SWPPP Appendices
5. ADEC ACGP SWPPP Completion Checklist
6. ADEC SWPPP Development Resources
7. ADEC Fact Sheet about the 2011 ACGP (AKR100000)
8. 18 AAC 72 Wastewater Disposal
9. 18 AAC 83 Alaska Pollutant Discharge Elimination System
10. ADEC Division of Water Alaska Storm Water Guide December 2011
11. ADEC Excavation Dewatering GP 2009DB0003
12. Contractor’s project-specific SWPPP

1.03 DEFINITIONS

A. Alaska Administrative Code (AAC): Refers to laws of the State of Alaska which contain the regulations of the various State of Alaska agencies.

B. Alaska Construction General Permit (ACGP): Refers to Permit No. AKR100000 which is the ADEC general permit for discharges from large and small construction activities. The permit authorizes and sets conditions on the discharge of pollutants from construction projects to waters of the United States. In order to ensure protection of water quality and human health, the permit describes control measures that must be used to control the types and amounts of pollutants that can be discharged from construction activities.

C. Alaska Department of Environmental Conservation (ADEC): Refers to the State of Alaska agency charged with conserving, improving and protecting Alaska's natural resources and environment
to enhance the health, safety, economic and social well-being of Alaskans.

D. Alaska Certified Erosion and Sediment Control Lead (AK-CESCL): Refers to a storm water training program created by the Alaska Storm Water Steering Committee to enhance compliance with the requirements of the ACGP.

E. Best Management Practice (BMP): BMPs include a wide range of project management practices, schedules, activities, or prohibition of practices, that when used alone or in combination, prevent or reduce fugitive dust, erosion, sedimentation, and/or pollution of adjacent water bodies and wetlands. BMPs include temporary or permanent structural and non-structural devices and practices such as temporary or permanent erosion and sediment controls.

F. Construction Quality Control (CQC): Refers to those actions taken by the Contractor (including those parties charged with the manufacture, supply, fabrication, delivery, and installation) to demonstrate and sometimes quantify the characteristics of the product. The results of the CQC program are compared to the Specifications and any other contractual or regulatory requirements. During each aspect of the Work, quality control shall be provided by the Contractor to ensure and document that the materials and workmanship conform to the Drawings and Specifications.

G. Construction Quality Assurance (CQA): Refers to those actions (including observations, verifications, audits, testing and evaluation), taken by the Engineer on behalf of the City, intended to provide adequate confidence that the materials and workmanship provided by the Contractor conform to the Drawings and Specifications and any applicable regulatory requirements.

H. Electronic Notice of Intent (eNOI). Refers to notice of intent to commence ground disturbing activities under the ACGP.

I. Electronic Notice of Termination (eNOT): Refers to notice of intent to cease ground disturbing activities under the ACGP.

J. Final Stabilization: A point in time when all ground-disturbing activities are complete and permanent erosion and sediment controls shown in the Drawings and the SWPPP are established and functional. The stabilized site is protected from erosive forces of raindrop impact and water flow.

K. Storm Water Pollution Prevention Plan (SWPPP): Refers to the Contractor's plan for erosion and sediment control and storm water management under the ACGP. The SWPPP is developed and implemented by the Contractor and describes site-specific BMPs identified for the Work.

1.04 **SUBMITTALS**

A. All submittals shall be in accordance with Section 01300.

B. Contractor shall submit a draft eNOI and a project specific SWPPP at least 45 days prior to start of Work. The SWPPP shall be prepared in accordance with the references listed in Section 1.2 and with Section 1.5 of this Specification. Ground disturbing Work shall not commence until the Engineer has reviewed and taken no exceptions to the SWPPP, all ADEC acknowledgements are in order, and the SWPPP and BMPs have been physically posted and implemented at the Site.

C. The SWPP shall also include detailed plans and specifications for following the ACGP permit conditions for construction dewatering and storm water discharge as conditions require. The plans and specifications shall also be in accordance with the related requirements of these contract documents.

D. Prior to start of ground disturbing Work the Contractor shall submit the AK-CESCL certification or certifications for designated SWPPP lead described in Section 1.5 of this specification. The submittal shall also specify the line of authority and designate the field representative for implementing SWPPP compliance.

E. Prior to shipping BMP material to the site, the Contractor shall submit to the Engineer the manufacturer product specifications, installation recommendations, and the Contractor's

proposed construction methods for the materials, equipment and activities listed or added to the SWPPP as BMPs. The submittal shall include a neat legible site plan showing proposed locations.

F. Within 7 days of each inspection the Contractor shall submit the SWPPP inspection report and a certification that the site is in compliance with the SWPPP. Include amendments to the SWPPP made to correct problems identified in the inspection or inspections.

G. After completion of the Work and Final Stabilization the Contractor shall submit the project eNOT and evidence of acknowledgment from ADEC within the time frame specified in the ACGP.

1.05 **Storm Water Pollution Prevention Plan**

A. Under current ADEC regulations, the City intends to delegate authority to the Contractor for SWPPP compliance after the City has reviewed the Contractor's SWPPP and draft eNOI submittal. The City will then submit the City eNOI and delegation forms to ADEC. Following the City submittal the Contractor will then submit their own eNOI, any other required documentation to ADEC, and pay all required fees. The Contractor is responsible for terminating the eNOI at the conclusion of the Contract with an eNOT. The City will terminate the City eNOI following the Contractor's termination.

B. For the duration of the Contract, the Contractor will be responsible to comply with all requirements of the AGCP, implement all temporary and permanent erosion and sediment control measures (BMPs) identified in the SWPPP, ensure that the SWPPP remains current, maintain all temporary and permanent erosion and sediment control measures in effective operating condition. The City reserves the right to perform due diligence including requiring co-inspections through their CQA program.

C. For the duration of the Contract, the contractor is responsible to provide an on-site AK-CESCL trained person with operational control over implementation of the SWPPP.

D. The SWPPP shall include construction details and locations of the necessary BMPs including but not limited to those items listed in this Specification.

E. The SWPPP shall include, as a minimum:
   1. All of the site specific controls and other elements required in the ADEC ACGP SWPPP Template and Appendices listed in Section 1.2 of this specification; and
   2. Statement that the Contractor is responsible for the coordination of the work of all trades.

1.06 **INSPECTIONS, MAINTENANCE, AND RECORDKEEPING**

A. Prior to start of Work, conduct a joint on-site inspection with the Engineer and the Contractor's AK-CESCL to discuss the implementation of the SWPPP.

B. Contractor shall inspect BMPs in the manner and frequency as required in the ACGP and the SWPPP.

C. As conditions warrant the Contractor shall immediately repair, replace, or add BMPs as required to meet the conditions of the ACGP and the SWPPP.

D. Contractor shall continue inspections and maintenance operations during periods of work stoppages or until Final Stabilization has been completed as per these Specifications, the Drawings, and the SWPPP.

E. Contractor shall keep and maintain SWPPP records onsite throughout construction activity and maintain these records in a manner and duration required in the ACGP and SWPPP. This requirement includes provision of records at the request of ADEC within the post eNOT record retention period of time specified in the ACGP.

1.07 **QUALITY ASSURANCE AND QUALITY CONTROL**

A. The Contractor shall perform the Work in accordance with Article 12 – General Conditions.

B. Contractor shall be responsible for CQC. Contractor shall engage and pay for the services of qualified staff or a qualified subcontractor to perform CQC for monitoring and documenting the quality of the SWPPP, performance of BMPs, and SWPPP implementation in accordance with these Specifications.

C. The Contractor shall accommodate and provide support for CQA activities described in this Specification.

D. Any Work that does not satisfy the requirements of the Drawings and these Specifications shall be made good in accordance with the requirements of the Specification or as directed by the Engineer at the sole expense of the Contractor.

PART 2 - PRODUCTS

2.01 **EROSION CONTROL MATTING, TURF REINFORCEMENT MATTING AND COCONUT FIBER MATTING**

A. Erosion Control Matting, shall conform to Section 02376 – Rolled Erosion Control Products.

2.02 **SILT FENCE**

A. Geotextile for silt fences shall be purchased in a continuous roll cut to the length of the barrier to avoid joints. If necessary, joints shall be constructed only at support posts and by splicing the geotextile together, with a minimum 6-inch overlap, and securely fastening both ends to the post.

B. Silt fence geotextile shall consist of a material specifically sold as silt fence and may be prefabricated with appropriate posts to facilitate installation.

C. Silt fence geotextile material shall meet the requirements of Table 1.

TABLE 1
GEOTEXTILE FOR TEMPORARY SILT FENCE

GEOTEXTILE PROPERTY	TEST METHOD	GEOTEXTILE PROPERTY REQUIREMENTS	
		UNSUPPORTED BETWEEN POSTS	SUPPORTED BETWEEN POSTS WITH WIRE OF POLYMERIC MESH
AOS for silt	ASTM D4751	.60 mm max. for slit film wovens (#30 sieve). 30 mm max. for all other geotextile types (#50 sieve) .15 mm min (#100 sieve)	.60 mm max for slit film wovens (#30 sieve). 30 mm max. for all other geotextile types (#50 sieve) .15 mm min (#100 sieve)
Water Permittivity	ASTM D4491	.02 sec – 1min.	.02 sec – 1min.

Grab Tensile Strength, min. in machine and x-machine direction	ASTM D4632	180 lbs. min. in machine direction, 100 lbs. min. in x-machine direction	100 lbs. min.
Grab Failure Strain, min. in machine direction only	ASTM D4632	30% max. at 180 lbs. or more	
Ultraviolet (UV) Re-Radiation Stability	ASTM D43556	70% Strength Retained min., after 500 hrs. in weatherometer	70% Strength Retained min., after 500 hrs. in weatherometer

D. Steel or wood posts, to support silt fence, shall be installed accordance with Manufacturer's instructions and the Alaska Storm Water Guide.

2.03 **STRAW BALES and Straw Waddle**

A. Straw bales and waddle shall be tied with wire or plastic.

B. The Straw shall be free of noxious weeds and reed canary grass seeds.

C. Straw bale and waddle check dams shall be fabricated by staking 2 or 3 straw bales or waddles across a perimeter surface water drainage ditch.

D. Straw bale or waddle barriers shall be fabricated by staking 3 or more straw bales or waddles across a surface water flow path. Straw bale or waddle barriers shall be constructed at the entrance to all surface water culverts.

2.04 **DUST PALLIATIVE**

A. Dust palliative shall consist of a biodegradable material specifically sold as a dust suppressant and approved by the Engineer.

2.05 **SANDBAGS**

A. Sandbags shall be constructed of material that is resistant to UV light degradation for a minimum of 2 years.

2.06 **TEMPORARY COVER**

A. Temporary Cover shall include, but not be limited to:

B. Erosion Control Matting in accordance with Section 02376 – Rolled Erosion Control Products.

PART 3 - EXECUTION

3.01 **GENERAL REQUIREMENTS**

A. Nothing within the SWPPP, the Drawings, or these Specifications shall relieve the Contractor from complying with other Contract requirements.

B. The Work defined by this Specification shall include, but not be limited to:
   1. The furnishing and delivery of all required materials; and
   2. The installation and maintenance of all BMPs within the Construction Limit shown on the Drawings.

C. If sediment-laden water, leaves the Construction Limits, the Engineer shall consider the existing erosion control measures to be inadequate. Contractor shall be required to

complete additional maintenance and/or construct additional erosion and sediment control facilities.

D. The Contractor shall not allow the area of work to exceed his ability to adequately prevent sediment from leaving the Construction Limits.

E. All elements of the Contractor's SWPPP implementation shall comply with the requirements of the ACGP.

F. When, in the opinion of the Engineer, temporary erosion and sedimentation control devices are no longer needed, the Contractor shall remove them and finish the areas in accordance with the Drawings and Specifications.

G. Contractor shall brief all employees and subcontractors working on the site about the project SWPPP. The briefing shall include, but not be limited to:
   1. BMP system maintenance;
   2. Spill prevention practices, spill response, and cleanup procedures; and
   3. The importance of BMPs, including details of the BMPs to be incorporated in the Work.

3.02 **TEMPORARY SURFACE WATER CONTROL SYSTEM**

A. Contractor shall construct temporary surface water diversion ditches to protect all open trenches or excavations from stormwater runon and runoff.

B. All pumps and temporary storage tanks used as part of the temporary stormwater control system shall be adequately designed and operated during storm event to prevent off-site migration of storm water or materials from within the Construction Limits.

C. During construction, the Contractor shall maintain adequate drainage conveyance features downstream of the construction area to provide controlled conveyance of runoff. The Contractor shall repair any damage to existing and constructed landfill features that, in the opinion of the Engineer, are a result of failure to provide proper construction period drainage features.

3.03 **CONSTRUCTION OPERATIONS**

A. Contractor shall construct and install all BMPs and shall fully stabilize all graded and disturbed areas in accordance with the SWPPP, the Drawings and these Specifications and as designated by the Engineer.

B. BMP measures shall remain in operation until installation of all features is completed and accepted. Final Stabilization shall be completed prior to the removal of temporary erosion and sedimentation control measures.

C. Contractor shall limit construction operations to the area within the Construction Limits as shown on the Drawings. Any areas outside the Construction Limits that are disturbed without the express direction of the Engineer shall be stabilized at the sole expense of the Contractor. The Contractor is responsible for their own ACGP compliance on all related off-site locations such as quarries, stockpile locations, etc.

D. The Contractor shall maintain good housekeeping practices for the duration of the Work, especially with the use of oils, fuel, and chemicals. The use of oil, fuel and chemicals during construction shall comply with the requirements of the SWPPP and all other local state, and federal regulations.

3.04 **MAINTENANCE**

A. Contractor shall maintain, clean and remove all sediment and debris from permanent surface water facilities, including all catch basins, manholes, and pipes within the construction limits no less than once per month.

B. Contractor shall maintain, clean and remove sediment from all BMP structures no less than once per month.

C. Contractor shall repair and maintain BMPs that are within the Construction Limits and are to form part of either the temporary or permanent erosion controls for the Work.

3.05 **DUST CONTROL**

A. The requirements for dust control documented in the approved SWPPP shall be implemented by the Contractor for the duration of the Work.

B. If, in the opinion of the Engineer, the dust pollution at the site is excessive due to the Contractor's failure to control dust during Work, the work shall be stopped on grounds that the Contractor is not performing work to required quality standards. Any such work stoppage shall be at the Contractor's sole expense.

C. Water shall be applied as needed for the control of dust to all roads trafficked as part of the Work. The Contractor shall apply water by means of tank trucks equipped with spray bars. Spray controls shall ensure that the water flows evenly and in amounts adequate for the control of dust.

D. The Engineer may direct that the Contractor apply water at night or early in the morning to reduce evaporation losses.

E. If necessary, spray exposed soil areas with dust palliative.

F. Vehicular speeds shall not exceed 20 miles per hour on gravel roads and 10 miles per hour through construction zones in order to control dust and to promote safety within the work area.

G. Contractor vehicles are prohibited from travel on un-surfaced roads and travel on roads other than those designated by the Drawings for Contractor vehicles. Contractor vehicles are prohibited from off road travel except for vehicles at the working face and construction areas.

H. Approved cover shall be provided for all exposed bulk materials and/or stockpiles including, but not limited to, sand, gravel, soil, aggregates, or any other potential dust generating material.

I. Any water obtained for dust control application shall be coordinated with the City Water Utility, metered and paid for by the Contractor, as required by City Ordinance.

3.06 **EQUIPMENT WASHING**

A. Equipment washing, including truck washing, shall not result in the discharge of any water to drainage-ways. Truck wash water shall be appropriately disposed of by infiltration or by hauling to an approved discharge facility.

B. Equipment washing detergent wash water shall be handled in a manner acceptable to the entity having jurisdiction.

C. Cleaning solvents shall be used only where drips and spills can be captured and properly disposed.

D. Concrete wash water shall be disposed of in an area where the wash water will not run off before the concrete residue can harden. The concrete residue shall be disposed of in the active landfill on the direction of the Engineer.

END OF SECTION

SECTION 01600
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General product requirements.

B. Re-use of existing products.

C. Transportation, handling, storage and protection.

D. Product option requirements.

E. Substitution limitations and procedures.

F. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

A. Section 01100 - Summary: .

B. Section 01400 - Quality Requirements: Product quality monitoring.

1.03 REFERENCE STANDARDS

A. 16 CFR 260 - Guides for the Use of Environmental Marketing Claims; Federal Trade Commission; current edition.

B. CAN/CSA Z809 - National Standard for Sustainable Forest Management; CSA International Inc.; 2008.

C. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
   1. For products specified only by reference standards, list applicable reference standards.

B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

A. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.

B. Reused Products: Reused products include materials and equipment previously used in this or other construction, salvaged and refurbished as specified.

2.02 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by the Contract Documents.

B. Provide interchangeable components of the same manufacture for components being replaced.

2.03 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.04 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION PROCEDURES

A. Instructions to Bidders specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section.

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

C. A request for substitution constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
   2. Will provide the same warranty for the substitution as for the specified product.
   3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
   4. Waives claims for additional costs or time extension that may subsequently become apparent.

D. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

E. Substitution Submittal Procedure:
   1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.
   2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
   3. Owner's representative will notify Contractor in writing of decision to accept or reject request.

3.02 TRANSPORTATION AND HANDLING

A. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

B. Transport and handle products in accordance with manufacturer's instructions.

C. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

D. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

E. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

3.03 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.

B. Store and protect products in accordance with manufacturers' instructions and accepted practice.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.

E. Provide off-site storage and protection when site does not permit on-site storage or protection.

F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

G. Prevent contact with material that may cause contamination, degradation, corrosion, discoloration, or staining.

H. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 01700
EXECUTION REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Surveying for laying out the work.

C. Cleaning and protection.

D. Starting of systems and equipment.

E. Demonstration and instruction of Owner personnel.

F. Closeout procedures, except payment procedures.

G. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

A. Section 01100 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.

B. Section 01300 - Administrative Requirements: Submittals procedures.

C. Section 01400 - Quality Requirements: Testing and inspection procedures.

D. Section 01510 - Temporary Utilities: Temporary heating, cooling, and ventilating facilities.

E. Section 01575 - Temporary Erosion and Sedimentation Control: Additional erosion and sedimentation control requirements.

F. Section 01732 - Waste Management: Additional procedures for trash/waste removal, recycling, salvage, and reuse.

G. Section 01780 - Closeout Submittals: Project record documents, operation and maintenance data, warranties and bonds.

H. Section 01810 - Commissioning: Contractor's responsibilities in regard to commissioning.

I. Section 02225 - Demolition: Demolition of whole structures and parts thereof; site utility demolition.

1.03 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

1.04 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
   1. On request, submit documentation verifying accuracy of survey work.
   2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in conformance with Contract Documents.
   3. Submit surveys and survey logs for the project record.

1.05 QUALIFICATIONS

A. For survey work, employ a land surveyor registered in Alaska and acceptable to Owner's representative. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.

1.06 PROJECT CONDITIONS

A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment and obtain permission for pumping discharge locations.

B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

C. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of mold, mildew, dust, fumes, vapors, or gases.

D. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.

E. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
   1. Minimize amount of bare soil exposed at one time.

F. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.07 COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Notify affected utility companies and comply with their requirements.

C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

F. Coordinate completion and clean-up of work of separate sections.

G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01600.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for the work. Start of work means acceptance of existing conditions.

B. Examine and verify specific conditions described in individual specification sections.

C. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

D. Verify that utility services are available, of the correct characteristics, and in the correct locations.

E. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Owner's representative of any discrepancies discovered.

C. Control datum for survey is indicated on Drawings.

D. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

E. Promptly report to Owner's representative the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

F. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Owner's representative.

G. Utilize recognized engineering survey practices.

H. Establish elevations, lines and grades. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements.
   2. Grid or axis for building structures.
   3. Building foundation, column locations, ground floor elevations.

I. Periodically verify layouts by same means.

J. Maintain a complete and accurate log of control and survey work as it progresses.

3.04 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.05 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. Perform whatever cutting and patching is necessary to:
   1. Complete the work.
   2. Fit products together to integrate with other work.
   3. Provide openings for penetration of mechanical, electrical, and other services.
   4. Match work that has been cut to adjacent work.
   5. Repair areas adjacent to cuts to required condition.
   6. Repair new work damaged by subsequent work.
   7. Remove samples of installed work for testing when requested.
   8. Remove and replace defective and non-conforming work.

C. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

D. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

E. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

F. Restore work with new products in accordance with requirements of Contract Documents.

G. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

H. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material, to full thickness of the penetrated element.

I. Patching:
   1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
   2. Match color, texture, and appearance.
   3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.06 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.07 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

G. Prohibit traffic from landscaped areas.

H. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.

3.08 SYSTEM STARTUP

A. Coordinate with requirements of Section 01810 - Commissioning.

B. Coordinate schedule for start-up of various equipment and systems.

C. Notify Owner's representative and owner seven days prior to start-up of each item.

D. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

E. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

F. Verify that wiring and support components for equipment are complete and tested.

G. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

H. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

I. Submit a written report that equipment or system has been properly installed and is functioning correctly.

J. Coordinate startup date with substantial completion and ADEC's Interim Approval to Construct (AIC).

3.09 DEMONSTRATION AND INSTRUCTION

A. See Section 01820 - Demonstration and Training.

3.10 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.11 FINAL CLEANING

A. Execute final cleaning prior to final project assessment.
   1. Clean areas to be occupied by Owner prior to final completion before Owner occupancy.

B. Use cleaning materials that are nonhazardous.

C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces,

D. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

E. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

F. Clean filters of operating equipment.

G. Clean debris from roofs, gutters, downspouts, and drainage systems.

H. Clean site; sweep paved areas, rake clean landscaped surfaces.

I. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.12 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.
   1. Provide copies to Owner's representative and Owner.

B. Notify Owner's representative when work is considered ready for Substantial Completion.

C. Submit written certification that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Owner's representative's review.

D. Correct all items of work listed in executed Certificates of Substantial Completion and comply with requirements for access to Owner-occupied areas.

E. Notify Owner's representative when work is considered finally complete.

F. Complete items of work determined by Owner's representative's final inspection.

END OF SECTION

SECTION 01732
WASTE MANAGEMENT

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

A. Owner requires that this project generate the least amount of trash and waste possible.

B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

D. Methods of trash/waste disposal that are not acceptable are:
   1. Burning on the project site.
   2. Burying on the project site.
   3. Dumping or burying on other property, public or private.
   4. Other illegal dumping or burying.

E. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 RELATED REQUIREMENTS

A. Section 01300 - Administrative Requirements

B. Section 01500 - Temporary Facilities and Controls

C. Section 01600 - Product Requirements

D. Section 01700 - Execution Requirements

1.03 DEFINITIONS

A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.

B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.

D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

I. Return: To give back reusable items or unused products to vendors for credit.

J. Reuse: To reuse a construction waste material in some manner on the project site.

K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

N. Toxic: Poisonous to humans either immediately or after a long period of exposure.

O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.04 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 WASTE MANAGEMENT PROCEDURES

A. See Section 01300 for additional requirements for project meetings, reports, submittal procedures, and project documentation.

B. See Section 01500 for additional requirements related to trash/waste collection and removal facilities and services.

C. See Section 01600 for waste prevention requirements related to delivery, storage, and handling.

D. See Section 01700 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

3.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

B. Meetings: Discuss trash/waste management goals and issues at project meetings.
   1. Pre-bid meeting.
   2. Pre-construction meeting.
   3. Regular job-site meetings.

C. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
   1. Provide adequate containers as required.
   2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
   3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

D. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

E. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

F. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

G. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

H. Responsibility: Contractor is responsible for all disposal fees.

END OF SECTION

SECTION 01780
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project Record Documents.

B. Operation and Maintenance Data.

C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

A. Section 01300 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

B. Section 01700 - Execution Requirements: Contract closeout procedures.

C. Individual Product Sections: Specific requirements for operation and maintenance data.

D. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

A. Project Record Documents: Submit documents to Owner's representative with claim for final Application for Payment.

B. Operation and Maintenance Data:
   1. Submit two copies of preliminary draft or proposed formats and outlines of contents before plant startup. Owner's representative will review draft and return one copy with comments.
   2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
   3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Owner's representative comments. Revise content of all document sets as required prior to final submission.
   4. Submit two sets of revised final documents in final form within 30 days after final inspection.

C. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
   2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other modifications to the Contract.
   5. Reviewed shop drawings, product data, and samples.
   6. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Maintain electronic documentation in the form of digital pictures that shall be retained and provided to the owner after completion for the following, but not limited to, any concealed piping, valves, conduit, fuel lines. Schedule of required documentation shall be agreed upon in

the form of a submittaland also related documentation and images shall be included in the O & M manuals in the appropriate sections.

D. Store record documents separate from documents used for construction.

E. Record information concurrent with construction progress.

F. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
   1. Manufacturer's name and product model and number.
   2. Product substitutions or alternates utilized.
   3. Changes made by Addenda and modifications.

G. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
   1. Measured depths of foundations in relation to finish first floor datum.
   2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
   3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
   4. Field changes of dimension and detail.
   5. Details not on original Contract drawings.

H. Final record drawings shall be provided in CADD format and shall be organized similar to the design drawings. Two full-size drawings shall be provided to the owner and Larsen Consulting Group along with the digital files.

3.02 OPERATION AND MAINTENANCE DATA

A. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

B. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

C. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
   1. Product data, with catalog number, size, composition, and color and texture designations.
   2. Information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.

D. Additional information as specified in individual product specification sections.

E. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
   1. Description of unit or system, and component parts.
   2. Identify function, normal operating characteristics, and limiting conditions.
   3. Include performance curves, with engineering data and tests.
   4. Complete nomenclature and model number of replaceable parts.

B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.

D. Include color coded wiring diagrams as installed.

E. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

F. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

G. Provide servicing and lubrication schedule, and list of lubricants required.

H. Include manufacturer's printed operation and maintenance instructions.

I. Include sequence of operation by controls manufacturer.

J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

K. Provide control diagrams by controls manufacturer as installed.

L. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.

M. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

N. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage. Recommended spare parts shall be stored on-site and shall be verified through the submittal process to insure appropriate spares are provided. Spare parts shall be provided or be included as installed spares as part of this contract for any equipment that is essential to the operation of the system as a whole ans should take into account the inability to operate all equipment at all times due to routine maintenance.

O. Include test and balancing reports.

P. Additional Requirements: As specified in individual product specification sections.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

B. Where systems involve more than one specification section, provide separate bookmarked divider for each system.

C. Prepare instructions and data by personnel experienced in maintenance and operation of described products.

D. Prepare data in the form of an instructional manual and in an indexed and bookmarked electronic PDF file.

E. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

F. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

G. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Owner's representative, Consultants, Contractor and subcontractors, with names of responsible parties.

H. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.

I. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.

J. Text: Manufacturer's printed data, or typewritten data on 24 pound paper.

K. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

L. Arrange content by systems under section numbers and sequence of Table of Contents of this Project Manual.

M. Contents: Prepare a Table of Contents for each volume, with each product or system description identified, in three parts as follows:
   1. Part 1: Directory, listing names, addresses, and telephone numbers of Owner's representative, Contractor, Subcontractors, and major equipment suppliers.
   2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
      a. Significant design criteria.
      b. List of equipment.
      c. Parts list for each component, including spare parts.
      d. Operating instructions.
      e. Maintenance instructions for equipment and systems.
      f. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
   3. Part 3: Project documents and certificates, including the following:
      a. Shop drawings and product data.
      b. Certificates.
      c. Photocopies of warranties and bonds.

N. Provide a listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.

O. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of Owner's representative, Consultants, and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.

3.06 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 30 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

E. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.

F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.

G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.

H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

END OF SECTION

SECTION 01810
COMMISSIONING

PART 1 GENERAL

1.01 SUMMARY

A. Commissioning is intended to achieve the following specific objectives; this section specifies the Contractor's responsibilities for commissioning:
   1. Verify that the work is installed in accordance with the Contract Documents and the manufacturer's recommendations and instructions, and that it receives adequate operational checkout prior to startup: Startup reports and Pre-functional Checklists executed by Contractor are utilized to achieve this.
   2. Verify and document that functional performance is in accordance with the Contract Documents.
   3. Verify that operation and maintenance manuals submitted to Owner are complete: Detailed operation and maintenance (O&M) data submittals by Contractor are utilized to achieve this.
   4. Verify that the Owner's operating personnel are adequately trained: Formal training conducted by Contractor is utilized to achieve this.

B. Commissioning, including Functional Tests, O&M documentation review, and training, is to occur after startup and initial checkout and be completed before Functional Completion with penalty for non-completion as defined in the Conditions of the Contract.

C. The Contractor directs and coordinates all commissioning activities and executes performance of this work; this section describes some but not all of the Contractor's responsibilities.

1.02 SCOPE OF COMMISSIONING

A. The following are to be commissioned:

B. Plumbing Systems:

C. HVAC System, including:

D. Electrical Systems:

E. Electronic Safety and Security:

F. Communications:

G. UV System

H. Other equipment and systems explicitly identified elsewhere in Contract Documents as requiring commissioning.

I. Entire system as a complete operable turnkey system.

1.03 RELATED REQUIREMENTS

A. Section 01700 - Execution Requirements: General startup requirements.

B. Section 01780 - Closeout Submittals: Scope and procedures for operation and maintenance manuals and project record documents.

C. Section 01820 - Demonstration and Training: Scope and procedures for Owner personnel training.

D. Section 16900 - Electrical Controls

1.04 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures

B. Manufacturers' Instructions: Submit copies of all manufacturer-provided instructions that are shipped with the equipment as soon as the equipment is delivered.

C. Product Data: If submittals to Owner's representative do not include the following, submit copies as soon as possible:
   1. Manufacturer's product data, cut sheets, and shop drawings.
   2. Manufacturer's installation instructions.
   3. Startup, operating, and troubleshooting procedures.
   4. Fan and pump curves.
   5. Factory test reports.
   6. Warranty information, including details of Owner's responsibilities in regard to keeping warranties in force.

D. Commissioning Plan and Reports.

E. Completed Prefunctional Checklists.

PART 2 PRODUCTS

2.01 TEST EQUIPMENT

A. Provide all standard testing equipment required to perform startup and initial checkout and required Functional Testing; unless otherwise noted such testing equipment will NOT become the property of Owner.

B. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner; such equipment, tools, and instruments are to become the property of Owner.

C. Dataloggers: Independent equipment and software for monitoring flows, currents, status, pressures, etc. of equipment.
   1. Dataloggers required to for Functional Tests will be provided by the Contractor and will not become the property of Owner.

PART 3 EXECUTION

3.01 COMMISSIONING PLAN

A. Contractor will prepare the Commissioning Plan.
   1. Attend meetings with the Owner and Owners Representative called for purposes of completing the commissioning plan.
   2. Require attendance and participation of relevant subcontractors, installers, suppliers, and manufacturer representatives. Request attendance of Owner and Owner’s Representative personnel.

B. Contractor is responsible for compliance with the approved Commissioning Plan.

C. Commissioning Plan is the detailed and annotative commissioning schedule, training plans from 01820, misc checklists, syllabus, prefunctional checklists, functional test procedures, sensor and actuator calibration procedures, and coordination requirements for all parties in the commissioning process.

D. Commissioning Schedule:
   1. Submit anticipated dates of startup of each item of equipment and system to the Owner's Representative within 60 days prior to scheduled startup.
   2. Re-submit anticipated startup dates monthly, but not less than 4 weeks prior to startup.
   3. Prefunctional Checklists and Functional Tests are to be performed in sequence from components, to subsystems, to systems.
   4. Provide sufficient notice to Owners Representative for delivery of relevant Checklists and Functional Test procedures, to avoid delay.

3.02 STARTUP PLANS AND REPORTS

A. Startup Plans: For each item of equipment and system for which the manufacturer provides a startup plan, submit the plan not less than 8 weeks prior to startup.

B. Startup Reports: For each item of equipment and system for which the manufacturer provides a startup checklist (or startup plan or field checkout sheet), document compliance by submitting the completed startup checklist prior to startup, signed and dated by responsible entity.

C. Submit directly to the Owners Representative.

3.03 PREFUNCTIONAL CHECKLISTS

A. A Prefunctional Checklist is required to be filled out for each item of equipment or other assembly specified to be commissioned.
   1. No sampling of identical or near-identical items is allowed.
   2. These checklists do not replace manufacturers' recommended startup checklists, regardless of apparent redundancy.
   3. Prefunctional Checklist forms will not be complete until after award of the contract; the following types of information will be gathered via the completed Checklist forms:
      a. Certification by installing contractor that the unit is properly installed, started up, and operating and ready for Functional Testing.
      b. Confirmation of receipt of each shop drawing and commissioning submittal specified, itemized by unit.
      c. Manufacturer, model number, and relevant capacity information; list information "as specified," "as submitted," and "as installed."
      d. Serial number of installed unit.
      e. List of inspections to be conducted to document proper installation prior to startup and Functional Testing; these will be primarily static inspections and procedures; for equipment and systems may include normal manufacturer’s start-up checklist items and minor testing.
      f. Sensor and actuator calibration information.

B. Contractor is responsible for filling out Prefunctional Checklists, after completion of installation and before startup.
   1. Each line item without deficiency is to be witnessed, initialed, and dated by the actual witness; checklists are not complete until all line items are initialed and dated complete without deficiencies.
   2. Checklists with incomplete items may be submitted for approval provided the Contractor attests that incomplete items do not preclude the performance of safe and reliable Functional Testing; re-submission of the Checklist is required upon completion of remaining items.
   3. Individual Checklists may contain line items that are the responsibility of more than one installer; Contractor shall assign responsibility to appropriate installers or subcontractors, with identification recorded on the form.
   4. If any Checklist line item is not relevant, record reasons on the form.
   5. Contractor may independently perform startup inspections and/or tests, at his option.
   6. Regardless of these reporting requirements, Contractor is responsible for correct startup and operation.
   7. Submit completed Checklists to Owners Representative within two days of completion.
   8. See Section 01700 for additional general startup requirements.

C. Contractor is responsible for furnishing the Prefunctional Checklists to the Owner's Representative.
   1. Initial Drafts: Contractor is responsible for initial draft of Prefunctional Checklist where so indicated in the Contract Documents.
   2. Provide all additional information requested by the Owner's Representative to aid in preparation of checklists, such as shop drawing submittals, manufacturers' startup checklists, and O&M data.
   3. Owner's Representative may add any relevant items deemed necessary regardless of whether they are explicitly mentioned in the Contract Documents or not.
   4. When asked to review the proposed Checklists, do so in a timely manner.

D. Owner's Representative Witnessing: Required for:

1. Each piece of primary equipment, unless sampling of multiple similar units is allowed by the Commissioning Plan.
2. A sampling of non-primary equipment, as allowed by the Commissioning Plan.

E. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.
1. If difficulty in correction would delay progress, report deficiency to the Owners Representative immediately.

3.04 FUNCTIONAL TESTS

A. A Functional Test is required for each item of equipment, system, or other assembly specified to be commissioned, unless sampling of multiple identical or near-identical units is allowed by the final test procedures.

B. Contractor is responsible for execution of required Functional Tests, after completion of Prefunctional Checklist and before closeout.

C. Contractor is responsible for correction of deficiencies and re-testing at no extra cost to Owner; if a deficiency is not corrected and re-tested immediately, the Owner's Representative will document the deficiency and the Contractor's stated intentions regarding correction.
1. Deficiencies are any condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents or does not perform properly.
2. When the deficiency has been corrected, the Contractor completes the form certifying that the item is ready to be re-tested and will reschedule the test and shall re-test.
3. Identical or Near-Identical Items: If 10 percent, or three, whichever is greater, of identical or near-identical items fail to perform due to material or manufacturing defect, all items will be considered defective; provide a proposal for correction within 2 weeks after notification of defect, including provision for testing sample installations prior to replacement of all items.
4. Contractor shall bear the cost of Owner and Owner's Representative personnel time witnessing re-testing.
5. Contractor shall bear the cost of Owner and Owner's Representative personnel time witnessing re-testing if the test failed due to failure to execute the relevant Prefunctional Checklist correctly; if the test failed for reasons that would not have been identified in the Prefunctional Checklist process, Contractor shall bear the cost of the second and subsequent re-tests.

D. Functional Test Procedures:
1. Some test procedures are included in the Contract Documents; where Functional Test procedures are not included in the Contract Documents, test procedures will be determined by the Owner's Representative with input by and coordination with Contractor.
2. Examples of Functional Testing:
   a. Test the dynamic function and operation of equipment and systems (rather than just components) using manual (direct observation) or monitoring methods under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint).
   b. Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc.
   c. Systems are run through all the HVAC control system’s sequences of operation and components are verified to be responding as the sequence's state.
   d. Traditional air or water test and balancing (TAB) is not Functional Testing; spot checking of TAB by demonstration to the Owners Representative is Functional Testing.

E. Deferred Functional Tests: Some tests may need to be performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions; performance of these tests remains the Contractor's responsibility regardless of timing.

3.05 SENSOR AND ACTUATOR CALIBRATION

A. Calibrate all field-installed temperature, relative humidity, carbon monoxide, carbon dioxide, and pressure sensors and gages, and all actuators (dampers and valves) on this piece of equipment shall be calibrated. Sensors installed in the unit at the factory with calibration certification provided need not be field calibrated.

B. Calibrate using the methods described below; alternate methods may be used, if approved by Owner beforehand. See PART 2 for test instrument requirements. Record methods used on the relevant Prefunctional Checklist or other suitable forms, documenting initial, intermediate and final results.

C. All Sensors:
   1. Verify that sensor location is appropriate and away from potential causes of erratic operation.
   2. Verify that sensors with shielded cable are grounded only at one end.
   3. For sensor pairs that are used to determine a temperature or pressure difference, for temperature make sure they are reading within 0.2 degree F of each other, and for pressure, within tolerance equal to 2 percent of the reading, of each other.
   4. Tolerances for critical applications may be tighter.

D. Sensors Without Transmitters - Standard Application:
   1. Make a reading with a calibrated test instrument within 6 inches of the site sensor.
   2. Verify that the sensor reading, via the permanent thermostat, gage or building automation system, is within the tolerances in the table below of the instrument-measured value.
   3. If not, install offset, calibrate or replace sensor.

E. Sensors With Transmitters - Standard Application.
   1. Disconnect sensor.
   2. Connect a signal generator in place of sensor.
   3. Connect ammeter in series between transmitter and building automation system control panel.
   4. Using manufacturer’s resistance-temperature data, simulate minimum desired temperature.
   5. Adjust transmitter potentiometer zero until 4 mA is read by the ammeter.
   6. Repeat for the maximum temperature matching 20 mA to the potentiometer span or maximum and verify at the building automation system.
   7. Record all values and recalibrate controller as necessary to conform with specified control ramps, reset schedules, proportional relationship, reset relationship and P/I reaction.
   8. Reconnect sensor.
   9. Make a reading with a calibrated test instrument within 6 inches of the site sensor.
   10. Verify that the sensor reading, via the permanent thermostat, gage or building automation system, is within the tolerances in the table below of the instrument-measured value.
   11. If not, replace sensor and repeat.
   12. For pressure sensors, perform a similar process with a suitable signal generator.

F. Sensor Tolerances for Standard Applications: Plus/minus the following maximums, unless specified otherwise:
   1. Watthour, Voltage, Amperage: 1 percent of design.
   2. Pressure, Air, Water, Gas: 3 percent of design.
   3. Air Temperatures (Outside Air, Space Air, Duct Air): 0.4 degrees F.
   4. Relative Humidity: 4 percent of design.
   5. Barometric Pressure: 0.1 inch of Hg.
   6. Flow Rate, Air: 10 percent of design.
   7. Flow Rate, Water: within 4 percent over design flow range.
   8. AHU Wet Bulb and Dew Point: 2.0 degrees F.

G. Critical Applications: For some applications more rigorous calibration techniques may be required for selected sensors. Describe any such methods used on an attached sheet.

H. Valve/Damper Stroke Setup and Check:

1. For all valve/damper actuator positions checked, verify the actual position against the control system readout.
2. Set pump/fan to normal operating mode.
3. Command valve/damper closed; visually verify that valve/damper is closed and adjust output zero signal as required.
4. Command valve/damper to open; verify position is full open and adjust output signal as required.
5. Command valve/damper to a few intermediate positions.
6. If actual valve/damper position does not reasonably correspond, replace actuator or add pilot positioner (for pneumatics).

I. Isolation Valve or System Valve Leak Check: For valves not associated with coils.
1. With full pressure in the system, command valve closed.
2. Use an ultra-sonic flow meter to detect flow or leakage.

3.06 TEST PROCEDURES - GENERAL

A. Provide skilled technicians to execute starting of equipment and to execute the Functional Tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.

B. Provide all necessary materials and system modifications required to produce the flows, pressures, temperatures, and conditions necessary to execute the test according to the specified conditions. At completion of the test, return all affected equipment and systems to their pre-test condition.

C. Sampling: Where Functional Testing of fewer than the total number of multiple identical or near-identical items is explicitly permitted, perform sampling as follows:
1. Identical Units: Defined as units with same application and sequence of operation; only minor size or capacity difference.
2. Sampling is not allowed for:
   a. Major equipment.
   b. Life-safety-critical equipment.
   c. Prefunctional Checklist execution.
3. XX = the percent of the group of identical equipment to be included in each sample; defined for specific type of equipment.
4. YY = the percent of the sample that if failed will require another sample to be tested; defined for specific type of equipment.
5. Randomly test at least XX percent of each group of identical equipment, but not less than three units. This constitutes the "first sample."
6. If YY percent of the units in the first sample fail, test another XX percent of the remaining identical units.
7. If YY percent of the units in the second sample fail, test all remaining identical units.
8. If frequent failures occur, resulting in more troubleshooting than testing, the Commissioning Authority may stop the testing and require Contractor to perform and document a checkout of the remaining units prior to continuing testing.

D. Manual Testing: Use hand-held instruments, immediate control system readouts, or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the “observation”).

E. Simulating Conditions: Artificially create the necessary condition for the purpose of testing the response of a system; for example apply hot air to a space sensor using a hair dryer to see the response in a VAV box.

F. Simulating Signals: Disconnect the sensor and use a signal generator to send an amperage, resistance or pressure to the transducer and control system to simulate the sensor value.

G. Over-Writing Values: Change the sensor value known to the control system in the control system to see the response of the system; for example, change the outside air temperature value from 50 degrees F to 75 degrees F to verify economizer operation.

H. Indirect Indicators: Remote indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100 percent closed, are considered indirect indicators.

I. Monitoring: Record parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of the relevant control systems; where monitoring of specific points is called for in Functional Test Procedures:
   1. All points that are monitored by the relevant control system shall be trended by Contractor; at the Owner's Representatives request, Contractor shall trend up to 20 percent more points than specified at no extra charge.
   2. Other points will be monitored by the Contractor using dataloggers.
   3. At the option of the Owners Representative some control system monitoring may be replaced with datalogger monitoring.
   4. Provide hard copies of monitored data in columnar format with time down left column and at least 5 columns of point values on same page.
   5. Graphical output is desirable and is required for all output if the system can produce it.
   6. Monitoring may be used to augment manual testing.

3.07 OPERATION AND MAINTENANCE MANUALS

A. See Section 01780 for additional requirements.

B. Add design intent documentation furnished by the Owner's Representative to manuals prior to submission to the Owner.

C. Submit manuals related to items that were commissioned to Owner's Representative for review; make changes recommended by Owner's Representative.

D. Contractor will add commissioning records to manuals after submission to Owner.

END OF SECTION

SECTION 01820
DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 SUMMARY

A. Demonstration of products and systems to be commissioned and where indicated in specific specification sections.

B. Training of Owner personnel in operation and maintenance is required for:
   1. All software-operated systems.
   2. HVAC systems and equipment.
   3. Plumbing equipment.
   4. Electrical systems and equipment.
   5. Items specified in individual product Sections.

1.02 RELATED REQUIREMENTS

A. Section 01780 - Closeout Submittals: Operation and maintenance manuals.

B. Section 01810 - Commissioning: Additional requirements applicable to demonstration and training.

C. Other Specification Sections: Additional requirements for demonstration and training.

1.03 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures; except:
   1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Owners Representative.
   2. Submit one copy to the Owners Representative, not to be returned.
   3. Make commissioning submittals on time schedule specified by Owner's Representative.
   4. Submittals indicated as "Draft" are intended for the use of the Contractor in preparation of overall Training Plan; submit in editable electronic format, Microsoft Word preferred.

B. Draft Training Plans: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
   1. Submit to Owner's Representative for review and inclusion in overall training plan.
   2. Submit not less than four weeks prior to start of training.
   3. Revise and resubmit until acceptable.
   4. Provide an overall schedule showing all training sessions.
   5. Include at least the following for each training session:
      a. Identification, date, time, and duration.
      b. Description of products and/or systems to be covered.
      c. Name of firm and person conducting training; include qualifications.
      d. Intended audience, such as job description.
      e. Objectives of training and suggested methods of ensuring adequate training.
      f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
      g. Media to be used, such a slides, hand-outs, etc.
      h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.

C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
   1. Include applicable portion of O&M manuals.
   2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
   3. Provide one extra copy of each training manual to be included with operation and maintenance data.

D. Training Reports:
   1. Identification of each training session, date, time, and duration.

2. Sign-in sheet showing names and job titles of attendees.
3. List of attendee questions and written answers given, including copies of and references to supporting documentation required for clarification; include answers to questions that could not be answered in original training session.
4. Include Owners Representatives formal acceptance of training session.

1.04 QUALITY ASSURANCE

A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
   1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
   2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DEMONSTRATION - GENERAL

A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.

B. Demonstrations conducted during Functional Testing need not be repeated unless Owner personnel training is specified.

C. Demonstration may be combined with Owner personnel training if applicable.

D. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.
   2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

E. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.02 TRAINING - GENERAL

A. The Contractor will prepare the Training Plan based on draft plans submitted.

B. Conduct training on-site unless otherwise indicated.

C. Owner will provide classroom and seating at no cost to Contractor.

D. Do not start training until Functional Testing is complete, unless otherwise specified or approved by the Owner’s Representative.

E. Provide training in minimum two hour segments.

F. The Owner’s Representative is responsible for determining that the training was satisfactorily completed and will provide approval forms at the Contractor’s request.

G. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.

H. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
   1. The location of the O&M manuals and procedures for use and preservation; backup copies.
   2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
   3. Typical uses of the O&M manuals.

I. Product- and System-Specific Training:
   1. Review the applicable O&M manuals.
   2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
   3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
   4. Provide hands-on training on all operational modes possible and preventive maintenance.
   5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
   6. Discuss common troubleshooting problems and solutions.
   7. Discuss any peculiarities of equipment installation or operation.
   8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
   9. Review recommended tools and spare parts inventory suggestions of manufacturers.
   10. Review spare parts and tools required to be furnished by Contractor.
   11. Review spare parts suppliers and sources and procurement procedures.

J. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION

SECTION 02230
SITE CLEARING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Clearing and protection of vegetation.

B. Removal of existing debris.

1.02 RELATED REQUIREMENTS

A. Section 01100 - Summary

B. Section 01500 - Temporary Facilities and Controls

C. Section 01575 - Temporary Erosion and Sedimentation Control

D. Section 01700 - Execution Requirements

E. Section 02310 - Grading

F. Section 02316 - Fill and Backfill

1.03 REFERENCE STANDARDS

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 SITE CLEARING

A. Comply with other requirements specified in Section 01700 Execution Requirements.

B. Minimize production of dust due to clearing operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

3.02 EXISTING UTILITIES AND BUILT ELEMENTS

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Protect existing structures and other elements that are not to be removed.

3.03 VEGETATION

A. Do not remove or damage vegetation beyond the limits indicated on drawings.

B. Vegetation Removed: Do not burn, bury, landfill, or leave on site, except as indicated.

C. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to Owner.

3.04 DEBRIS

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 02310
GRADING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Removal of topsoil and unsuitable soils.

B. Rough grading the site for site structures and building pads.

C. Finish grading.

1.02 RELATED REQUIREMENTS

A. Section 01575 - Temporary Erosion and Sedimentation Control

A. Section 02230 - Site Clearing

B. Section 02315 - Excavation

C. Section 02316 - Fill and Backfill

D. Section 02317 - Rock Excavation

1.03 SUBMITTALS

A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

PART 2 PRODUCTS

2.01 MATERIALS

A. Fill Materials: See Section 02316 - Fill and Backfill.

B. Stabilization Geotextile: See Section 02316 - Fill and Backfill

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Stake and flag locations of known utilities.

C. Locate, preserve and protect from damage, above- and below-grade utilities to remain.

D. Protect site features to remain, including but not limited to bench marks, survey control points, and existing structures, from damage by grading equipment and vehicular traffic.

3.03 ROUGH GRADING

A. Remove topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.

B. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.

C. See Section 02316 for filling procedures.

D. See Section 02315 for excavation procedures.

E. Stability: Replace damaged or displaced subsoil to same requirements as for classified fill.

3.04 FINISH GRADING

A. Before Finish Grading:
   1. Verify building and trench backfilling have been inspected.
   2. Verify subgrade has been contoured and compacted.

B. Remove debris, roots, branches, stones, in excess of 2 inch in size. Remove soil contaminated with petroleum products and other deleterious material.

C. Place stabilization geotextile where required.

3.05 SURPLUS EXCAVATION, DEBRIS AND RUBBISH CONTROL

A. Remove surplus excavation, debris and rubbish in such a manner that spillage into water courses and on adjacent area will be prevented.

B. Any material that is spilled in transit to the disposal site shall be cleaned up immediately.

C. Debris and rubbish temporarily stored on the site should be covered and protected as required to control unauthorized access and hazardous conditions.

3.06 TOLERANCES

A. Top Surface of Subgrade: Plus or minus 0.10 foot from required elevation.

3.07 REPAIR AND RESTORATION

A. Existing Facilities, Utilities, and Site Features to Remain: If damaged due to this work, repair or replace to original condition.

3.08 FIELD QUALITY CONTROL

A. See Section 02316 for compaction density testing.

END OF SECTION

SECTION 02315
EXCAVATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Excavating for building volume below grade, footings, slabs-on-grade, site structures, and utilities below the building.

B. Trenching for utilities outside the building to utility main connections.

1.02 RELATED REQUIREMENTS

A. Section 01575 - Temporary Erosion and Sedimentation Control

B. Section 01700 - Execution Requirements

C. Section 02310 - Grading

D. Section 02316 - Fill and Backfill

E. Section 02317 - Rock Excavation

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench marks and intended elevations for the work are as indicated.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. See Section 02310 for additional requirements.

3.03 EXCAVATING

A. Excavate to accommodate new structures, construction operations, and utility installation.

B. Notify the Owner's Representative of unexpected subsurface conditions and discontinue affected Work in area until authorized to resume work.

C. Protect equipment and vehicular traffic from trenches and excavations by providing adequate barricades and signage.

D. Protect excavations or adjacent structures by providing adequate backslopes, shoring, bracing, or other methods required to prevent failure of the excavation, or existing soils, subject to approval of Owner's Representative. Construction procedures during trench excavations shall comply with current OSHA regulations.

E. Do not interfere with 45 degree bearing splay of foundations.

F. Cut utility trenches wide enough to allow backfill compaction and inspection of installed utilities.

G. Hand trim excavations. Remove loose matter.

H. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 02316 - Fill and Backfill.

I. Grade top perimeter of excavation to prevent surface water from draining into excavation.

J. Where ground water is encountered or stormwater collects in excavations, the Contractor shall provide drainage through pumping or ditching to ensure that the bedding does not become saturated before placement of the backfill material. Water shall be pumped to an approved location.

1. The CONTRACTOR is to determine the necessity, means, methods and duration and perform execution of dewatering in accordance with the AGCP and the SWPPP.
2. The CONTRACTOR shall provide the dewatering plan as a submittal if dewatering is required.
3. The cost of dewatering is to be considered incidental to the work and no separate payment or additional compensation will be made for it.

END OF SECTION

SECTION 02316
FILL AND BACKFILL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Filling, backfilling, and compacting for building volume below grade.

B. Backfilling and compacting for utilities outside the building to utility main connections.

C. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

1.02 RELATED REQUIREMENTS

A. Section 01575 - Temporary Erosion and Sedimentation Control

B. Section 02310 - Grading

C. Section 02315 - Excavation

D. Section 02317 - Rock Excavation

1.03 REFERENCE STANDARDS

A. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2006.

B. ASTM D422 - Standard Test Method for Particle-Size Analysis of Soils; 2007

C. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012.

D. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2007.

E. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2012.

F. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.

G. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.

H. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2010.

I. ASTM D4718 - Standard Practice for Correction of Unit Weight and Water Content for Soils Containing Oversize Particles; 2007

J. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2010.

1.04 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Submit the following data that verify the products fully conform to the specifications and plans before delivery of the product:
   1. One sieve analysis (ASTM D422) for each type of fill / surface course product.
   2. One modified proctor (ASTM D1557 and ASTM D4718) per material source of Classified Fill.
   3. One modified proctor (ASTM D1557 and ASTM D4718) per material source of Aggregate Surface Course.
   4. Material data submittals shall not be more than 30 days old.
   5. Stabilization Geotextile.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. Classified
   1. Classified Fill and backfill shall contain no lumps, frozen material, organic matter, or other deleterious matter. It shall have a plasticity index not greater than six (6) as determined by ASTM D4318 and shall generally conform to Municipality of Anchorage's (MOA) Type II.
   2. Materials furnished by the Contractor for use as Classified Fill and/or backfill shall be graded within the limitations below.

U.S. Standard Sieve Size	Percent Passing by Dry Weight
8”	100
3”	70-100
1-1/2”	55-100
3/4"	45-85
No. 4”	20-60
No. 10”	12-50
No. 40”	4-30
No. 200”	2-6

In addition to the grading limits listed above, the fraction of material passing the No. 200 sieve shall not be greater than 15% of that fraction passing the No. 4 sieve.

B. Surface Course Material
   1. Aggregate Surface Course shall be placed on the entire gravel pad. Aggregate Surface Course shall conform with the aggregate quality and gradation D -1 in Section 703 of Alaska DOT&PF Standard Specifications for Highway Construction (2004). Aggregate Surface Course shall be completely unfrozen and drained at the time it is placed and compacted.

U.S. Standard Sieve Size	Percent Passing by Dry Weight
1"	100
3/4"	70-100
3/8"	50-80
No. 4	35-65
No. 8	20-60
No. 50	8-30
No. 200	0-6

C. Classified Bedding Material
   1. Materials furnished by the Contractor for use as Classified Bedding shall conform to meet all requirements of the surface course material.

2.02 GEOSYNTHETICS

A. Stabilization Geotextile
   1. Stabilization Geotextile, also referred to as Geotextile Fabric, shall be a woven product meeting the requirements for a Class 1 geotextile in AASHTO M288-00, Table 1, and functional requirements for stabilization geotextile in AASHTO M288-00, Table 4. Stabilization Geotextile shall be placed following the requirements in Section 631 of Alaska DOT& PF Standard Specifications for Highway Construction (2004).

2.03 SOURCE QUALITY CONTROL

A. See Section 01400 - Quality Requirements, for general requirements for testing and analysis of soil material.

B. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.

C. If tests indicate materials do not meet specified requirements, change material, retest, and resubmit.

D. Compaction testing will be provided by the OWNER.

PART 3 EXECUTION

3.01 EXAMINATION

A. Identify required lines, levels, contours, and datum locations.

B. See Section 02310 for additional requirements.

3.02 PREPARATION

A. Cut out soft areas of subgrade not capable of compaction in place according to the Geotechnical Reports. Backfill with classified fill.

B. Compact subgrade by proof rolling with no less than three passes with pneumatic - tired rolling equipment.

C. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.03 STABILIZATION GEOTEXTILE PLACEMENT

A. The Stabilization Geotextile shall be delivered, stored, handled, and installed in accordance with the manufacturer's recommendations, unless otherwise modified by these specifications.

B. The Stabilization Geotextile shall be placed as shown on the plans or as directed in these specifications. Place the Stabilization Geotextile in continuous longitudinal strips in the direction perpendicular to the face of the slope. Joints parallel to the face of the slope shall not be permitted. Horizontal coverage of less than 100% shall not be allowed unless specifically detailed in the construction drawings. In the case of 100% coverage in plan view adjacent strips need not be overlapped.

C. Adjacent rolls of Stabilization Geotextile shall be overlapped or mechanically connected where exposed in a wrap-around face system, as applicable. Geotextile fabric shall be overlapped by a minimum 3 feet or mechanically connected to adjacent existing geotextile fabric from Phase 1 construction, where applicable. Where such conditions occur, contractor shall expose a minimum 3 feet of existing geotextile fabric and replace gravel and compact per the specifications.

D. Place only that amount of Stabilization Geotextile required for immediately-pending work to prevent undue exposure and/or damage.

E. Stabilization Geotextile shall be placed to lay flat and pulled tight prior to covering with soil fill. After a layer of Stabilization Geotextile has been placed, suitable means, such as pins or small piles of soil, shall be used to hold it in position until the subsequent soil fill can be placed. Under no circumstances shall a track-type vehicle be allowed on the Stabilization Geotextile before at least 8 inches of Classified Fill has been placed. Braking and turning, sufficient to displace the soil fill, shall be avoided.

F. Each layer of Stabilization Geotextile shall be placed as shown in the Plans, unless otherwise directed by the OWNER'S REPRESENTATIVE. Correct orientation of the Stabilization Geotextile shall be verified by the CONTRACTOR.

3.04 CLASSIFIED FILL PLACEMENT

A. Fill to contours and elevations indicated using specified materials in unfrozen condition.

B. Employ a placement method that does not disturb or damage other work.

C. Systematically fill to ensure uniform lifts. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

D. Maintain optimum moisture content of fill materials to attain required compaction density.

E. Unless otherwise specified, the soil fill shall be placed in lifts up to 12 inches maximum thickness, loose, where heavy compaction equipment is to be used, and 6 inches maximum thickness, loose, where hand operated equipment is used.
   1. Each lift of soil fill shall be spread in a uniform thickness before compacting.
   2. The soil fill shall be placed, spread, and compacted in such a manner to minimize the development of wrinkles and/or displacement of the Stabilization Geotextile.
   3. The initial lift of soil fill placed on saturated or swampy ground can be up to 24 inches (24") thick, if necessary to support the hauling equipment.

F. After completion of excavation, fine grading, clearing and grubbing, or other surface preparation measures and prior to fill, proof-roll the surface to detect soft or loose zones. Proof roll the surface making a minimum of 3 passes each way, back and forth (6 passes total) using a vibratory soil compactor capable of delivering 55,000 lbs of centrifugal force, such as a CAT CP-533E. Maintain suitable moisture for the purposes of detecting wet, soft, loose under-compacted, over optimum soil moisture, or optimum density of materials too course for density testing using nuclear methods. Compact subsequent lifts of classified fill with 8 passes total each lift to obtain adequate compaction. Leveling Course, and Bedding Material densities will be tested using nuclear methods.

G. All finished slope surface greater than 1.5' shall be track walked. All other finished slope surfaces shall be back-dragged.

3.05 SURFACE COURSE PLACEMENT

A. The underlying course shall be checked and accepted by the OWNER'S REPRESENTATIVE before placing and spreading operation are started. Any ruts or soft areas shall be corrected and compacted to the required density before placing aggregate surface course.

B. The aggregate surface course shall be placed to the lines and grades shown on the drawings. The aggregate surface course shall be constructed without segregation of the aggregate. The aggregate surface course shall be placed in lifts not to exceed 6" and compacted to 95% of maximum dry unit weight, as determined by ASTM D1557. Testing personnel shall be given reasonable time to make field density determinations prior to placement of successive layers of material.

C. The aggregate surface course shall be finished by blading or with automated equipment specifically designed for this purpose. In no case shall thin layers of material be added to the top of surface course to meet grade. If the compacted elevation of the top layer is 0.1 feet or more below grade, it shall be scarified to a depth of at least 3 inches, new material added, and the layer shall be blended and compacted to bring it to grade.

D. After the aggregate surface course has been completely compacted, the surface will be tested by the OWNER'S REPRESENTATIVE for smoothness and accuracy of grade and crown. The finished grade elevation shall not vary more than 0.1 feet from the design elevation. The finished grade surface shall not vary more than 0.05 feet from a 16-foot straightedge when applied to the surface parallel with, and at right angles to, the centerline. Any portion lacking the required smoothness or failing in accuracy of grade or crown shall be corrected to within the specified tolerances.

E. Hauling equipment may be routed over completed portions of the aggregate surface course, provided no damage results and provided that such equipment is routed over the full width of the surface course to avoid rutting or uneven compaction. The OWNER'S REPRESENTATIVE will have full and specific authority to stop all hauling over completed or partially completed surface course when, in his/her opinion, such hauling is causing damage. Any damage resulting to the surface course from routing equipment over the surface course shall be repaired by the CONTRACTOR at no additional cost to the OWNER.

F. Maintenance

1. Following the completion of the aggregate surface course, and until final acceptance of the work, the Contractor shall remove all weak or loose spots, fill and compact the voids, and perform all maintenance work.
2. The aggregate surface course shall be properly drained at all times.

3.06 CLASSIFIED BEDDING PLACEMENT

A. Place classified bedding per section 3.05, Aggregate Surface Course Placement.

3.07 TOLERANCES

A. Plus or minus 0.10 feet from required elevations.

3.08 QUALITY CONTROL

A. See Section 01400 - Quality Requirements, for general requirements for field inspection and testing.

B. Modified proctor testing shall conform to ASTM D1557 (Laboratory Compaction Characteristics of Soil Using Modified Effort), Method C; and to ASTM D4718 (Correction of Unit Weight and Water Content for Soils Containing Oversized particles). Oversized material shall be defined as particles retained on the 3/4-inch sieve.

C. One sieve analysis of material test per lift and at a rate of one test per 10,000 square feet.

D. If tests indicate work does not meet specified requirements, remove work, replace and retest.

END OF SECTION

SECTION 02317
ROCK EXCAVATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Work included: Furnish all labor, material and equipment to excavate and dispose of rock as specified herein.

1.02 RELATED REQUIREMENTS

A. Section 01575 - Temporary Erosion and Sedimentation Control

B. Section 02315 - Excavation

C. Section 02316 - Fill and Backfill

D. Section 02500 - Water Systems

1.03 DEFINITION

A. The word "rock," wherever used as the name of excavated material or material to be excavated, shall mean boulders and pieces of concrete or masonry exceeding 1/2 cubic yard in volume; or solid bed rock which, in the opinion of the Owner's Representative, requires, for its removal drilling and blasting, wedging, sledging, barring, or breaking up with power-operated tools.

B. No soft, disintegrated, or unconsolidated rock which can be removed with a hand pick or power-operated excavator and/or loader; no loose, shaken, or broken stone in rock fillings or elsewhere; no frozen earth or existing paving; and no rock exterior to the maximum limits of measurement allowed, which may fall into the excavation, will be measured or allowed.

1.04 REQUIREMENTS OF REGULATORY AGENCIES

A. Observe all municipal ordinances and State and Federal laws relating to the transportation, storage, handling and use of explosives.

B. The licensed blaster(s) shall at all times have his license on the work site and shall permit examination thereof by officials having jurisdiction.

PART 2 - MATERIALS

2.01 EXPLOSIVES

A. Where blasting is permitted, explosives shall be kept on the site only in such quantity as may be needed for the work under way and only during such times as they are being used.

B. Explosives shall be stored in a secure manner, separate from all tools and flammable substances.

C. Caps or detonators shall be safely stored at least a distance of 100-feet from explosives.

D. When need for explosives has ended, all such materials remaining at site shall be promptly removed from the premises.

PART 3 - EXECUTION

3.01 GENERAL

A. Excavate rock (as defined above), if encountered, to the lines and grades indicated on the Drawings, or as required, and dispose of the excavated material.

B. Rock in pipe trenches shall be excavated so as to be not less than 6 inches below the invert of the pipe.

C. Rock in structure excavations shall be excavated to the bottom of the foundation.

D. Submit a rock removal plan to the Owner's Representative for acceptance prior to blasting.

3.02 BLASTING

A. All operations involving explosives shall be conducted by experienced personnel only, with all possible care to avoid injury to persons and damage to property.

B. Blasting shall be done only with such quantities and strengths of explosives and in such manner as will break the rock approximately to the intended line and grades and yet will leave the rock not to be excavated in an unshattered condition.

C. Care shall be taken to avoid excessive cracking of the rock upon or against which any structure will be built, and to prevent damage to existing pipes or other structures and property above or below ground. The responsibility for accurately locating and for the complete protection of such items in the event of blasting for rock excavation and all repair to and/or replacement of same shall be the full obligation of the contractor. In all cases of blasting, the prepared blast shall be carefully covered with an approved blasting mat so placed that the area affected by the explosion is positively confined.

D. Rock shall be well covered with logs, blasting mats, or both, where required.

E. Sufficient warning shall be given to all persons in the vicinity of the work before a charge is exploded. Flagmen shall be employed to direct traffic as required.

3.03 MEASUREMENT FOR PAYMENT

A. All rock excavation shall be part of the base bid contract. No separate payments will authorized for rock excavation and it shall be considered incidental to the project.

1. Information pertaining to subsurface explorations, borings, test holes, and other preliminary investigations appears in the bidding documents. This information was acquired for design purposes only and is not considered adequate for construction. The Owner does not warrant the correctness of the soils investigation or any interpretation, deduction, or conclusion given in the data relative to subsurface conditions. The Bidder shall make his own deductions and conclusions as to the nature of the materials to be excavated, the difficulties of making and maintaining the required excavations, the difficulties that may arise from the subsurface conditions, and any other work affected by the subsurface conditions, and shall accept full responsibility thereof.

2. Excavation is unclassified and includes all excavation and over-excavation necessary to perform the work, regardless of character or type of materials and obstructions or other hindrances encountered. The Contractor shall perform all excavation of every description and whatever substance encountered, including rock and dewatering or diversion of water

3.04 EXCESS ROCK EXCAVATION

A. If rock is excavated beyond the limits indicated on the Drawings or specified, the excess excavation whether resulting from overbreakage or other causes, shall be backfilled, by and at the expense of the contractor, as specified below:
   1. In pipe trenches, excess excavation above and below the elevation of the pipe bedding shall be filled with classified fill as specified in Section 02316 - Fill and Backfill.
   2. In excavations for structures, excess excavation in rock beneath foundations shall be filled with classified fill as specified in Section 02316 - Fill and Backfill.

3.05 SHATTERED ROCK

If rock below normal depth is shattered due to drilling or blasting operations and such shattered rock is unfit for foundations, the shattered rock shall be removed and the excavation shall be backfilled as described above in excess rock excavation. All such removal and backfilling shall be done at the expense of the contractor.

3.06 BLASTING RECORDS

Keep and submit to the owner an accurate record of each blast. The record shall show the general location of the blast, the depth and number of drill-holes, the kind and quantity of explosive used, and other data required for a complete record.

3.07 PROTECTION OF EXISTING UTILITIES AND STRUCTURES

Attention of contractor is specifically called to the fact that certain sections of the work may be constructed in close proximity to existing buildings, water lines, and other structures. The responsibility for accurately locating and for the complete protection of such items in the event of blasting for rock excavation and all repair to and/or replacement of same shall be the full obligation of the contractor. In all cases of blasting, the prepared blast shall be carefully covered with an approved blasting mat so placed that the area affected by the explosion is positively confined.

END OF SECTION

SECTION 02500
WATER SYSTEMS

PART 1GENERAL

1.01 SECTION INCLUDES

A. The Work covered by these Specifications consists of providing all labor, equipment, supplies, material, transportation, handling and storage, and performing all operations necessary to complete the construction of all exterior water facilities including piping, valves, fire hydrants, and appurtenances.

1.02 RELATED SECTIONS

A. Section 02315 - Excavation

B. Section 02316- Fill and Backfill

1.03 REFERENCES

A. The latest revision of the following standards of the American Society for Testing and Materials (ASTM) and the American Water Works Association (AWWA) are hereby made part of this Specification. The publications may be referred to in the text by basic designation only.

1. AWWA C-104 Cement Mortar Lining for Cast Iron and Ductile Iron Pressure Pipe Fittings
2. AWWA C-105 Polyethylene Encasement for Gray and Ductile Iron Piping
3. AWWA C-110 Gray Iron and Ductile Iron Fittings
4. AWWA C-111 Rubber Gasket Joints for Cast Iron and Ductile Iron Pressure Pipe Fittings
5. AWWA C-115 Flanged Cast Iron and Ductile Iron Pipe with Threaded Flanges
6. AWWA C-151 Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand Lined Molds
7. AWWA C-500 Gate Valves
8. AWWA C-502 Dry Barrel Fire Hydrants
9. AWWA C-600 Installation of Cast Iron Water Mains
10. AWWA C-601 Disinfecting Water Mains
11. AWWA C-800 Threads for Underground Service Line Fittings
12. AWWA C-906 Polyethylene Pressure Pipe and Fittings 4in. thru 63in. for Water Distribution
13. ASTM A-126 Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings
14. ASTM B-88 Standard Specification for Copper Water Tube
15. ASTM D1598 Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure
16. ASTM D1599 Test Method for Short-Time Hydraulic Failure Pressure of Plastic Pipe, Tubing, and Fittings
17. ASTM D2513 Specification for Thermoplastic Gas Pressure Pipe, Tubing, and Fittings
18. ASTM D3350 Specification for Polyethylene Plastic Pipe and Fittings Materials
19. ASTM F905 Standard Practice for Qualification of Polyethylene Saddle Fusion Joints
20. ASTM F1055 Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing
21. NFC, NFPA National Fire Codes, Volume I and Volume II, 1994 Codes and Standards, National Fire Protection Association

1.04 SURVEY

A. The Contractor's surveyor will lay out in the field the alignment and grade for Work to be done under the Contract. When laid out, the Contractor shall be responsible for the preservation of all line stakes, grade stakes, and hubs.

B. The ground line profile refers to the elevation of the ground directly above the centerline of pipe and the grade line refers to the elevation of the bottom pipe, except where otherwise noted.

C. The Drawings have all pertinent bench marks necessary for horizontal and vertical line and grade of the Work. Prior to utilizing such information control monuments, it shall be the Contractor's responsibility to verify bench marks and control monuments provided by the Owner's Representative and properly reference them. In the event they are damaged or removed during construction, the Contractor shall pay for any necessary replacement.

1.05 SUBMITTALS

A. Submit Manufacturer's Product Data under provisions of Sections 01300.

B. Contractor will prepare, maintain, and submit red-lined drawings of water system installation information. Location and invert elevations shall be recorded for the following: valves, fittings, utility crossings, and changes in alignment and grade. Locations shall indicate northing, easting, and elevation recording to the established survey control.

C. Measurement and drawing modifications will be maintained daily by the Contractor. The Contractor shall, prior to Final Acceptance, provide the Owner's Representative with neat clean set of red-lined drawings.

PART 2 MATERIALS

2.01 DUCTILE IRON (DI) PIPE

A. Pipe

1. Class 52 minimum (AWWA C-150) ductile iron pipe manufactured in accordance with AWWA C-151. Pipe shall be cement mortar lined in accordance with AWWA C-104. Rubber-gasket joints shall conform to AWWA C-111. “U.S. Pipe Tyton Joint” pipe or equal. Polyethylene encasement shall be per AWWA C-105.

B. Restrained Joint Pipe

1. Restrained joint pipe shall conform to all standards listed in the pipe specifications above. Joint restraint may be accomplished by the use of “U.S. Pipe Field Lok” gaskets (or equal) in Tyton Joint pipe, “U.S. Pipe TR-Flex” or “U.S. Pipe Usiflex Pipe” (or equal).

C. Fittings

1. Cement mortar lined ductile iron conforming to AWWA C-110 or AWWA C-153. Push-on joint, mechanical joint or restrained joint pipe fittings are acceptable depending on application. All fittings must have flexible joint restraint. Mechanical joint fittings must have “Megalug” retainer glands by EBBA iron or equal. Bolts for mechanical joint fittings shall be ductile iron, “Eballoy” or equal.

D. Continuity Straps

1. Two bronze wedges per joint or two cadwelded insulated OO AWG copper wire per joint. Cadwelds shall be coated with a bitumastic coating to prevent corrosion.

E. Valves

1. Main Line Valves up to 12” shall be resilient wedge gate valves rated at 250 psi conforming to AWWA C-509 “U.S. Pipe Metroseal 2500” or equal. Main Line Valves 16” and larger, shall be rubber seat butterfly valves with the seat securely fastened to the valve body and rated at 250 psi. Valves shall conform to AWWA C-504 “Pratt Triton HP-250” or equal. All mainline, service and fire hydrant shut-off valves whose 2” operating nut is greater than 36” below finish grade shall have an operator extension extending the operator to within 6” and 18” below the top of the riser.

F. Valve Boxes

1. 5” I.D. cast iron pipe with lid marked water. A plastic insert or cast iron dust cap to prevent rocks and debris from entering the pipe and covering the valve operator is required beneath the cover in the valve box; “Inland Foundry Company 2056 (valve box base), 2059, 2060 (valve box top section) and lug type cover” or equal. (Parts that are not interchangeable will not be accepted).

2.02 FIRE HYDRANTS

A. Shall have 5-1/4" valve opening with three nozzles and conform to AWWA C-502. One 4-1/2" pumper nozzle and two 2-1/2" hose nozzles with NFPA #1963 thread. Hydrants shall open by turning the operating nut counter clockwise. Inlet connection shall be 6" mechanical joint with "Megalug" restraint. Hydrants shall have a breakaway traffic flange and be a dry barrel hydrant. Hydrants shall be "Mueller Centurion", or "American Darling B62B", No substitutes. Fire hydrants shall receive two coats of oil base paint, per the drawings. Provide guard posts painted bright yellow to protect hydrant. There shall be no plugged drains. The area around the base of the hydrant shall be bedded with sufficient and proper bedding material to allow for the proper drainage of the hydrant. See drawings for installation guidelines.

2.03 MAIN TO MAIN CONNECTIONS

A. Connections to ductile iron shall be cut in with mechanical joint sleeves. Connections to other types of pipe will be made with "Romac 501-RC501" couplings or equal with stainless steel bolts and nuts.

PART 3 EXECUTION

3.01 CONSTRUCTION OF PIPE

A. Trench Excavation and Backfill:
   1. The Contractor shall provide all trench excavation and backfill, and compaction necessary to install pipe in accordance with Section 02315 - Excavation and Section 02316 - Fill and Backfill.

B. Materials Delivery:
   1. Pipe and appurtenances shall be handled in such a manner as to ensure delivery to the trench in a clean, sound, undamaged condition. Particular care shall be taken not to damage the pipe, pipe coating, or lining. Before installation, the pipe and appurtenances shall be examined by the Owner's Representative for defects, damage, and cleanliness.
   2. The amount of pipe strung at the job site shall be at the discretion of the Owner's Representative.
   3. Rubber gaskets shall be stored in a cool, clean, dark place to prevent damage from direct sunlight.

C. Installation:
   1. Installation shall be in accordance with the requirements of AWWA C-600. The interior of the pipe and accessories shall be thoroughly cleaned of foreign matter before being lowered into the trench. The pipe shall be kept clean during laying operation.
   2. Pipe and appurtenances shall be carefully lowered into the trench by means of derrick, ropes, belt slings, or other suitable equipment. Under no circumstances shall any of the pipe or appurtenances be dropped or dumped into the trench. Care shall be taken to avoid abrasion of the pipe coating. Poles used as levers or skids shall be of wood and shall have broad, flat faces to prevent damage to the pipe and coating.
   3. The trench bottom shall be graded to provide uniform support for the pipe barrel. Water shall be kept out of the trench by pumping, if necessary, until the jointing and pipe zone backfill are completed. When Work is not in progress, open ends of the pipe, fittings, and valves shall be securely plugged so that no trench water, earth or other substances will enter the pipes or fittings. Where any part of the coating or lining is damaged, repair/replacement shall be made by the Contractor at his expense and in a manner satisfactory to the Owner's Representative. At a sufficient distance, prior to encountering a known obstacle or tie into an existing pipe, the Contractor shall expose and verify the exact location of the obstacle or pipe so that proper alignment and/or grade may be determined before the pipe sections are laid in the trench and backfilled.
   4. Pipe ends shall be cut downstream of valves and capped with mechanical joint cap. Valves may not be left as a termination point. Contractor shall install vertically a 2x4 wood post at the end of each capped pipe.
   5. Cutting of pipe shall be done in a neat and workmanlike manner without damage to the pipe.

6. Taps into existing water main pipe shall be made with a mechanical hole cutter as manufactured by the Pilot Manufacturing Company.
7. Tap connections shall be tapping sleeves as shown on the Drawings.

D. Alignment and Grade
1. The pipe shall be so laid in the trench in such a way that after the line is completed, the bottom of the pipe conforms accurately to the grades and alignment shown on the drawings or given by the Owner's Representative. A maximum two-tenths (2/10) foot deviation from design elevation and alignment will be allowed. The pipe shall be generally straight to visual observation as determined by the Owner's Representative.
2. Both line and grade shall be checked and recorded in a field book for each installed piece of pipe and appurtenances. The Contractor shall have suitable survey instruments installed for transferring alignment and grades from offset hubs. He also shall have in his employ a person who is qualified to use such instruments and who shall have the responsibility of placing and maintaining such construction guides. The Contractor will furnish to the Owner's Representative a copy of the surveyor's notes for the newly installed pipe and appurtenances. The practice of placing backfill over a section of pipe to provide a platform for instruments shall be subject to the approval of the Owner's Representative.
3. All adjustments to line and grade shall be done by scraping away or filling the earth under the body of the pipe and not by blocking or wedging up. Deflections from a straight line or grade, as required by vertical curves, horizontal curves, or offsets shall not exceed the manufacturer's recommendations.
4. If alignment requires deflection in excess of the above limitations, the Contractor shall furnish bends to provide angular deflections within the limits allowable. Short -radius curves and closures shall be formed by shorter lengths of pipe, bevels, or fabricated specials.
5. Pipe shall not be laid when the bottom of the trench or sides of the trench to within one foot above the pipe are frozen. Backfill containing frozen material shall not be placed, nor shall the trench be left open during freezing weather so that the soil near the pipe is allowed to freeze.

3.02 FLUSHING AND TESTING

A. Prior to any tests performed, all newly installed water facilities, including fire lines, shall be open bore flushed. The Contractor, at his option, shall perform the disinfection, hydrostatic in any order of sequence. The Contractor is made aware, that in the event disinfection and continuity tests have been performed and repairs are made on the system in order to pass the hydrostatic test, all previous tests, including open bore flushing, shall be declared void and shall be repeated to the satisfaction of the Owner's Representative.

B. Flushing:
1. All newly installed water facilities shall be “Open-Bore” flushed to remove any foreign matter. “Open-Bore” flushing shall be accomplished prior to hydrostatic testing and disinfection at each extremity of the main, including all stub-outs and dead ends. The Contractor shall furnish, install and remove all fittings and pipes necessary to perform the flushing, at no additional cost to the Owner. Under no circumstances will open-bore flushing through hydrants or reduced outlets be permitted. The use of reducers will not be allowed.
2. It will be the Contractor's responsibility to notify the Owner's Representative forty-eight (48) hours in advance of any flushing operations. The Owner will not be responsible for any cost incurred by the Contractor flushing. Coordinate with the owner for operation of the valves and supply of the flush water.

C. Hydrostatic Testing:
1. A hydrostatic test will be conducted on all newly constructed water mains, fire hydrant leads and stub-outs after “Open-Bore” flushing in the presence of the Owner's Representative in accordance with the requirements of AWWA C-600 unless hereinafter modified. The Contractor, at his option, can either use a pressure test or a leakage test.

2. The Contractor shall furnish all necessary assistance, equipment, labor, materials, and supplies necessary to complete the test to the satisfaction of the Owner's Representative. The Contractor shall suitably valve-off or plug the outlet to the existing or previously tested water main at his expense, prior to making the required hydrostatic test. Prior to testing, all air shall be expelled from the pipe. If permanent air vents are not located at all high points, the Contractor shall, at his expense, install corporation cocks at such points so the air can be expelled as the line is slowly filled with water.
3. All main valves, fire hydrant auxiliary valves, fire hydrant main valves, and plugs shall be tested. All intermediate valves within the section being tested will be closed and reopened as directed by the Owner's Representative during the actual test. Only static pressure will be allowed on the opposite side of the end valves of the section being tested.
4. All hydrostatic testing will be performed through test copper. Use of fire hydrant and service connections for testing will not be allowed.
5. The hydrostatic pressure test shall be at 150 psi. The duration of each hydrostatic pressure test shall be 30 minutes. After the required test pressure has been reached, pumping will be terminated. If the pressure remains constant for 30 minutes without the aid of a pump, that section of the line will not be subject to any future hydrostatic test.
6. If a hydrostatic pressure test fails on any section, the Contractor has the option to perform a leakage test on that section. The Contractor shall furnish all necessary assistance, equipment, labor, tools, materials and supplies necessary to conduct the test.
7. Leakage for a newly installed main is determined by the following formula:
   a. $L = \frac{ND(P)\ 0.5}{7400}$
      L = Allowable leakage in gallons per hour.
      N = Summation of mechanical and push on joints in length of pipe tested.
      D = Diameter of pipe in inches.
      P = Test Pressure in pounds per square inch.
   b. The duration of each leakage test shall be two (2) hours, and during the test the main shall be subjected to the constant test pressure as defined above. The test pump shall be valved to ensure that constant test pressure is maintained throughout the test and all excess water returned to the supply tank.
   c. If the pressure decreases below the required test pressure during the two (2) hour period, the preceding portion of that test will be declared void. Cracked or defective pipe, gaskets, mechanical joints, fittings, valves, or hydrants discovered as a consequence of the hydrostatic tests shall be removed and replaced with sound material at the Contractor's expense. The test shall then be repeated until the results are satisfactory.
   d. The Contractor shall notify the Owner's Representative forty-eight (48) hours prior to any test and shall notify the Owner's Representative two (2) hours in advance of the scheduled time if the test is to be canceled.

D. Disinfection:
1. Chlorine shall be used for disinfection, where required. Chlorine shall be applied by one of the following methods: (1) liquid chlorine gas-water mixture, (2) direct chlorine gas feed, or (3) calcium hypochlorite and water mixture. Calcium hypochlorite shall be comparable to commercial products known as HTH, perchloren or Machochlor. The chlorinating agent shall be applied at the beginning of the section adjacent to the feeder connection, insuring treatment of the entire line. Water shall be fed slowly into the new line with chlorine applied in amounts to produce a dosage of forty (40) ppm to fifty (50) ppm. Application of the chlorine solution shall continue until the required dosage is evident at all extremities of the newly laid line.
2. Chlorine gas-water mixture shall be applied by means of a solution-feed chlorinating device. Chlorine gas shall be fed directly from a chlorine cylinder equipped with a suitable device for regulating the rate of flow and the effective diffusion of gas within the pipe. Calcium hypochlorite shall be injected or pumped into the water main. During the chlorination process, all intermediate valves and accessories shall be operated. Valves

shall be manipulated so that the strong chlorine solution in the line being treated will not flow back into the line supplying the water. Hydrostatic testing of a water line containing the chlorine mixture will not be allowed.

3. A residual of not less than five (5) ppm chlorine shall be produced in all parts of the water main and retained for a minimum period of twenty-four (24) hours. After which this residual shall be flushed from the line at its extremities until the replacement water tests are equal chemically and bacteriologically to those of the permanent source of supply. In no instance shall a water main be chlorinated before “Open-Bore” flushing.
   a. CHLORINATION

Pipe Diameter	Dosage per 100 feet
4"	0.60 oz.
6"	1.35 oz.
8"	2.75 oz.
10"	4.30 oz.

   b. Chlorinated water shall be dechlorinated before discharging. Do not allow discharge into a waterway without neutralizing disinfection residual.

E. Test and Air Vent Copper Pipe Removal:
   1. After completion of testing, all test and air vent copper pipe shall be removed and the corporation cock closed at the main, in the presence of the Owner's Representative.

3.03 CONSTRUCTION/WATER SERVICE LINES

A. Excavation and Backfill:
   1. The Contractor shall provide all excavation, backfill, and compaction necessary to install water service lines.

B. Excavation:
   1. Excavation for service connections shall be unclassified and the Contractor shall excavate whatever substances that are encountered to the depth required for the connections including rock.
   2. All services that are buried less than the minimum depth shown on the drawings shall be insulated with rigid insulation. The insulation shall be two feet (2') minimum in width or full width of the trench, whichever is greater, and shall be placed no further than six inches (6") above the pipe. The board shall be centered over the centerline of the pipe.
   3. No water service shall be within a distance of ten feet (10') from the sewer service.
   4. The Contractor shall be responsible for, and shall bear the expenses incurred, in the event that a main should be damaged during excavation or backfilling. The Contractor shall repair all damaged mains; however, the Contractor shall bear the cost of all material, labor, and other expenses thereof if the Water Utility is required to make repairs.
   5. All on-property installations shall be constructed to the same standard as off-property installations.

C. Backfill:
   1. The Contractor shall exercise due care in backfilling to keep the service box vertical and in place. In the event the service box is displaced, the Contractor will be required to excavate and restore the service box to the proper position. Any work necessary to restore the service box to the proper position will be performed at the Contractor's expense.

3.04 INSPECTION:

A. The Contractor shall give the Owner's Representative forty-eight (48) hours’ notice prior to when any underground water systems including (water lines, valves, fittings, service connections, fire hydrants, and bedding) are ready for final inspection. The Owner's Representative shall promptly take steps to inspect the work and give the Contractor notice that the work is satisfactory or shall provide the contractor with a punch list of items that do not meet the design or specifications. The Contractor shall promptly correct any deficiencies (if any) and the Owner's Representative shall notify the Contractor that the work is acceptable and final backfill may commence.

3.05 AS-BUILT DRAWINGS:

A. Shall be provided prior to final completion and/or before final payment is issued. Failure to provide required documentation and complete required task will in no way hold the owner liable for additional fees and or interest due to delay in payment.

B. Location and invert elevations shall be recorded for the following: gate valves, curb stops, corporation stops, air relief valves and fittings. Locations shall be established with two (2) swing-tie distances to permanent structures and when possible, tied to property corners.

END OF SECTION

SECTION 02515
DISINFECTING OF WATER TANK

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:
   1. American Water Works Association (AWWA):
      a. B300, Hypochlorites.
      b. B301, Liquid Chlorine.
      c. C652, Disinfection of Water Storage Facilities
   2. Standard Methods for the Examination of Water and Wastewater, as published by American Public Health Association, American Water Works Association, and the Water Environment Federation.

1.02 SUBMITTALS

A. Informational Submittals:
   1. Plan describing and illustrating conformance to appropriate AWWA standards and this specification
   2. Procedure and plan for cleaning and flushing tank.
   3. Procedures and plans for disinfection and testing.
   4. Proposed locations where Samples will be taken.
   5. Type of disinfecting solution and method of preparation.
   6. Certification that employees working with concentrated chlorine solutions or gas have received appropriate safety training.
   7. Method of disposal or dechlorination for highly chlorinated disinfecting water.
   8. Independent Testing Agency: Certification that testing agency is qualified to perform chlorine concentration sample testing and bacteriological testing in accordance with AWWA standards, agency requirements, and this Specification.
   9. Certified Bacteriological Test Results:
      a. Tank tested is free from coliform bacteria contamination.
      b. Forward results directly to City.

PART 2 PRODUCTS

2.01 WATER FOR DISINFECTION

A. Clean, uncontaminated, and potable.

B. City will supply potable quality water.

2.02 CONTRACTOR'S EQUIPMENT

A. Furnish chemicals and equipment, such as pumps and hoses, to accomplish disinfection.

B. Provide protection against cross-connections as required by AWWA C651.

PART 3 EXECUTION

3.01 GENERAL

A. Conform to AWWA C651 for pipes and pipelines and AWWA C652 for tanks and reservoirs, except as modified in these Specifications.

B. Disinfect the following items installed or modified under this Project, intended to hold, transport, or otherwise contact potable water:
   1. Interior surfaces of tank bottom and appurtenances to 8-feet above the floor.
   2. Disinfect surfaces of materials that will contact finished water, both during and following construction, using one of the methods described in AWWA C652 and C653. Disinfect prior to contact with finished water. Take care to avoid recontamination following disinfection.

C. Prior to application of disinfectants, clean tank of loose and suspended material.

D. Allow freshwater and disinfectant solution to flow into pipe or vessel at a measured rate so chlorine-water solution is at specified strength. Do not place concentrated liquid commercial disinfectant in pipeline or other facilities to be disinfected before it is filled with water.

3.02 SEQUENCING AND SCHEDULING

A. Commence initial disinfection after completion of following:
   1. Completion and acceptance of internal repairs and painting of system(s).

3.03 TANKS AND RESERVOIRS

A. CLEANING:
   1. Clean interior surfaces using water under pressure before sterilizing. Isolate tank from system to prevent contaminating materials from entering the distribution system. Cleaning shall:
      a. Remove all deposits of foreign nature.
      b. Remove all biological growths.
      c. Clean the baffles, pipes, tank slopes, bottom, and walls to 8-feet above the floor.
      d. Avoid damage to the structure.
      e. Avoid pollution or oil deposits by workers and equipment.
   2. Dispose of water used in cleaning in accordance with applicable regulations before adding disinfecting solution to tank.

B. Disinfecting Procedure: In accordance with AWWA C652, unless herein modified. Parts of structures, such as ceilings or overflows that cannot be immersed, shall be spray or brush disinfected.

3.04 DISPOSAL OF CHLORINATED WATER

A. Do not allow discharge into a waterway without neutralizing disinfection residual.

B. See the appendix of AWWA C652 for acceptable neutralization methods.

3.05 TESTING

A. Collection of Samples: Coordinate activities to allow Samples to be taken in accordance with this Specification.

B. Test Equipment:
   1. Clean containers and equipment used in sampling and make sure they are free of contamination.
   2. Obtain sampling bottles with instructions for handling from an independent testing laboratory.

C. Chlorine Concentration Sampling and Analysis: Collect and analyze Samples in accordance with AWWA C652.

D. After tanks have been cleaned, disinfected, and refilled to the top with potable water, take water Samples and have them analyzed for conformance to bacterial limitations for public drinking water supplies. The Owner shall be present for obtaining the sample and assuring timely delivery to a test lab.
   1. Samples shall be collected in accordance with applicable AWWA Standard.
   2. Samples shall be analyzed for coliform concentrations in accordance with latest edition of Standard Methods for the Examination of Water and Wastewater.
   3. A minimum of two Samples on each of 2 consecutive days shall be obtained and analyzed by standard procedures outlined by state and local regulatory agencies.
   4. Sampling points shall be representative and accepted by Engineer.

E. If minimum Samples required above are bacterially positive, disinfecting procedures and bacteriological testing shall be repeated on entire tank until bacterial limits are met.

END OF SECTION

SECTION 02725
PRECAST CONCRETE

PART 1 - GENERAL

1.01 DESCRIPTION

A. This specification shall apply to the materials and operations required for the installation of sanitary sewer and storm sewer manholes.

B. The extent of the work is indicated on the Contract Drawings.

1.02 REFERENCE STANDARDS

A. ASTM A 48 - Gray Iron Castings

B. ASTM C 478 - Precast Reinforced Concrete Manhole Sections (2013)

C. ASTM C 923 - Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals

D. ASTM A 153 - Standard Specifications for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

E. ASTM A 497 - Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete

F. ASTM A 775 - Standard Specification for Epoxy-Coated Steel reinforcing Bars

G. ASTM C 150 - Standard Specification for Portland Cement

H. ASTM D3963 - Standard Specification for Fabrication and Jobsite Handling of Epoxy Coated reinforcing Steel Bars

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Pyramid Water Treatment Plant Design Documents

1.04 QUALITY ASSURANCE

A. The materials and practices comprising the work shall conform to this and other referenced standard specifications.

1.05 SEWER MANHOLES

A. Sewer manholes shall be 48-inch inside diameter, reinforced concrete.

1.06 DISCHARGE HEADER

A. The discharge header can be a cast-in-place or precast, reinforced concrete structure constructed to the lines, grades and standards indicated in the WTP specifications and design drawings.

1.07 JOINT SEALING

A. Joint sealant shall be used to form a continuous watertight seal on the concrete base and between successive precast manhole or discharge header sections.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Cement shall conform to the following requirements:
   1. Cement for use in mortar shall conform to ASTM C91.
   2. Portland cement for use in precast and cast-in-place concrete, and in masonry grout and mortar shall conform to ASTM C150, Type II, IIA, or I-II.

B. Precast Barrels, Steps & Grates:

1. Riser Sections and Tops: Precast reinforced concrete conforming to ASTM C478. Precast tops shall be either eccentric cone or flat slab type. Concrete for precast sections shall have 4000 psi 28-day strength.
2. Riser Joints: Rubber gasket conforming to ASTM C443, bituminous mastic gasket, or butyl rubber gasket.
3. Mortar: Type M, conforming to Sandia Standard Specifications "Concrete Masonry."
4. Steps: Steel reinforced polypropylene conforming to ASTM C478.
5. Grates: Grates shall be custom fabricated from 304 stainless steel, manufactured to the standards and dimensions provided in the design drawings.

2.02 MANHOLES

A. Manhole components shall be designed for H-20 highway wheel loading and specific site conditions.

B. Manhole bases may be either precast or cast-in-place, as appropriate for the application, with a formed recess shaped to match the first precast shaft section. The manhole base shall extend 10-inches below the bottom of the lowest pipe and 6-inches above the top of the highest pipe.

C. Pipe penetrations for sewer applications shall incorporate a watertight flexible pipe connector or ring-type seal according to the method of manhole construction as shown in the Standard Drawings. Precast manholes shall utilize either an integrally cast embedded pipe connector, or a boot-type connector installed in a circular block out opening in accordance with ASTM C 923. Connections to existing manholes shall utilize a boot-type connector per ASTM C 923 installed in a cored opening. Cast-in-place bases shall incorporate a ring-type seal on the pipe to be embedded in the concrete.

D. CRUSHED ROCK BASE AND BACKFILL MATERIALS
   1. Crushed rock base and backfill materials shall be in accordance with Section 02300 Earthwork.

2.03 MANHOLE GRATES

A. The manholes have no top frames. Custom grates shall be fabricated and secured to the top of the manhole reducing slab or cone section per the design drawings. Grates shall have openings 24-inches in diameter. Provide a fabrication submittal to the owner's representative, for approval, in accordance with Section 1300 Administrative Requirements.

B. All manhole grates and securing hardware shall be min 304 stainless steel.

2.04 CONCRETE

A. Concrete used for manholes and appurtenances shall be in accordance with Section 03300 Cast-in-place Concrete.

2.05 JOINT SEALING COMPOUND

A. Joint sealing compound shall be a mastic-type material in a flexible rope or rolled form with removable wrapper, sized to into the key of manhole or vault sections. Joint sealant shall be approved by the owner's representative. Provide a submittal for joint sealing compound in accordance with Section 1300 Administrative Requirements.

2.06 REPAIR MORTAR AND EPOXY BONDING AGENT

A. Repair mortar and an epoxy bonding agent shall be used to repair minor surface damage to precast sections or cast-in-place manhole bases at the discretion of the owner's representative. Repair products shall be in accordance with Section 03300 Cast-in-place Concrete.

2.07 MORTAR

A. Mortar for use on joints between precast sections shall be in accordance with Section 03300 Cast-in-place Concrete.

2.08 DAMP-PROOFING

A. Damp-proofing material shall be in accordance with Section 03300 Cast-in-place Concrete.

PART 3 - EXECUTION

3.01 EARTHWORK

A. Manhole excavation, foundation stabilization (if necessary), placement of base material, backfill and compaction shall be performed in accordance with Section 02300.

3.02 MANHOLE BASE

A. General: Manholes shall be constructed at the locations and elevations indicated and as detailed on the Contract Drawings. Installed pipe invert elevations at manholes shall not vary by more than 0.05' from the invert elevations designated on the Contract Drawings.

B. During construction of cast-in-place bases, all sewer pipes and stub piping shall be in place, including ring-type seals before concrete placement. Pipe grade and alignment shall be verified immediately upon placement of concrete to assure that the pipelines are in proper position to the concrete taking an initial set. The invert elevation and flow line of piping shall be as shown on the Approved Plans and Standard Drawings.

C. Cast-in-place bases shall set a minimum of 24-hours before the manhole construction is continued. In certain critical situations, the setting time may be reduced upon approval of the owner’s representative.

D. Manhole Bases: Prior to manhole installations, prepare a subgrade soil foundation a minimum of 12" beneath the elevation of the bottom of the concrete manhole base and compact to 95% maximum density as determined by ASTM D1557. Cast-in-place concrete for the base shall have 3000 psi 28-day strength. If bedrock is encountered, excavate as necessary to maintain minimum concrete thickness and pour concrete directly on bedrock.

E. Joints in precast riser sections and tops shall be made using gasket materials in accordance with the manufacturer's written installation instructions.

F. Sewer pipe joints shall be located immediately outside the manhole barrel both upstream and downstream. Pipe sections built into manhole walls shall be reinforced with grout so that the manhole and adjoining pipe sections are monolithic.

G. Manhole Floors: Manhole floors shall be made of grout and the work shall be free of any rough corners or sudden changes in direction such that a steady uniform flow with a minimum of wave action will be provided. Changes in direction and grade will consist of the largest curve radius the manhole diameter will permit. Free vertical drop from any branch or service line shall not exceed one half the mainline pipe diameter measured from the mainline upstream invert.

H. Manhole steps shall be cast-in-place or driven into precast or site-drilled holes. Steps shall be installed not more than 16" apart vertically on the interior wall directly beneath the manhole cover according to ASTM C478.

I. Manhole grates shall be installed as detailed.

J. Fill all lifting holes and other voids inside and outside with non-shrink grout. The inside of the manhole shall be cleaned of all loose mortar, framing materials and other debris.

END OF SECTION

SECTION 03100
CONCRETE FORMS AND ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Formwork for cast-in place concrete, with shoring, bracing and anchorage.

B. Openings for other work.

C. Form accessories.

D. Form stripping.

1.02 RELATED REQUIREMENTS

A. Section 03200 - Concrete Reinforcement.

B. Section 03300 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials; 2010.

B. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute; 2010.

C. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; American Concrete Institute; 2011.

D. ACI 347 - Guide to Formwork for Concrete; American Concrete Institute; 2004.

E. ASME A17.1 - Safety Code for Elevators and Escalators; The American Society of Mechanical Engineers; 2010.

F. PS 1 - Structural Plywood; 2009.

1.04 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 347, Recommended Practice for Concrete Formwork.

B. Perform work of this section in accordance with the standards of the City of Unalaska.

C. Concrete forms shall be cleaned of all material or other objects which would be considered deleterious to the concrete structure or surface.

PART 2 PRODUCTS

2.01 FORMWORK - GENERAL

A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.

B. Design and construct to provide resultant concrete that conforms to design with respect to shape, lines, and dimensions.

C. Chamfer outside corners of beams, joists, columns, and walls.

D. Comply with applicable State and local codes with respect to design, fabrication, erection, and removal of formwork.

E. Comply with relevant portions of ACI 347, ACI 301, and ACI 318.

2.02 GENERAL

A. Materials for concrete forms may be new or used wood, steel or other material capable of producing the required tolerances and finishes. The quality of the materials, not the age or previous usage, shall be the determining factor as to their suitability.

2.03 WOOD FORM MATERIALS

A. Framing lumber shall be standard dimensions and of such quality to meet the requirements of the stresses applied.

B. Plyform plywood shall be used for all exposed concrete forms. The plywood shall be exterior type without splits or knot holes and sanded smooth. The face grain of the plywood shall run perpendicular to the studs and joists. All joints of forms used on exposed surfaces shall be vertical or horizontal. Plywood shall not be less than 1/2-inch thick.

C. Square-edged boards or tongue-and-groove sheathing may be used for forming unexposed concrete surfaces.

D. Form Materials: At the discretion of the Contractor.

E. Softwood Plywood: PS 1, D Grade, Group 2.

2.04 REMOVABLE PREFABRICATED FORMS

A. Preformed Steel Forms: Minimum 16 gage matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

B. Glass Fiber Fabric Reinforced Plastic Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished concrete surfaces.

C. Pan Type: Steel, of size and profile indicated.

2.05 FORM LINERS AND COATINGS

A. Forms shall be lined, coated or treated with a suitable bond-breaker to ensure their timely removal with minimum damage to the concrete. Bond-breaker material shall be non-coloring and shall not leave a film on the concrete surface which will prohibit the subsequent finishing activities required to attain the desired appearance.

2.06 FORMWORK ACCESSORIES

A. Form ties shall be manufactured items with stress values published. Form ties shall have pre-measured break-back weakened area so ties can be removed within 3/4-inch of the concrete surface.

B. Wire ties and wood spacers shall not be used.

C. Corner brackets, column clamps and other specialized accessories shall be utilized in accordance with the manufacturer's recommendation.

D. Forms shall be lined, coated or treated with a suitable bond-breaker to insure their timely removal with minimum damage to the concrete. Bond-breaker material shall be non-coloring and shall not leave a film on the concrete surface which will prohibit the subsequent finishing activities required to attain the desired appearance.

E. Form Release Agent: Capable of releasing forms from hardened concrete without staining or discoloring concrete or forming bugholes and other surface defects, compatible with concrete and form materials, and not requiring removal for satisfactory bonding of coatings to be applied.

F. Filler Strips for Chamfered Corners: Rigid plastic type; 3/4" x 3/4" inch size; maximum possible lengths.

G. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.

H. Embedded Anchor Shapes, Plates, Angles and Bars: As specified in Section 05120.

PART 3 EXECUTION

3.01 GENERAL

A. Forms shall be set to allow for structural camber plus an allowance for shrinkage and settlement. The finished concrete shall conform to the lines and grades indicated on the drawings.

3.02 EXAMINATION

A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.03 EARTH FORMS

A. Earth forms are not permitted.

3.04 ERECTION - FORMWORK

A. Exposed inside and outside corners shall be chamfered 1-inch except as shown otherwise on drawings.

B. All forms shall be mortar tight.

C. Standing water in the forms will not be permitted.

D. Immediately prior to placing concrete the forms shall be cleaned.

E. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.

F. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

G. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

H. Align joints and make watertight. Keep form joints to a minimum.

I. Coordinate this section with other sections of work that require attachment of components to formwork.

3.05 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
   1. The compound shall be applied at a rate recommended by the manufacturer, which will provide a smooth surface, free of dusting action caused by the chemical reaction of the compound.

B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

3.06 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings where required for items to be embedded in passing through concrete work.

B. Locate and set in place items that will be cast directly into concrete.

C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts and components of other work.

D. Install accessories in accordance with manufacturer's instructions, so they are straight, level, and plumb. Ensure items are not disturbed during concrete placement.

3.07 FORM CLEANING

A. Clean forms as erection proceeds, to remove foreign matter within forms.

B. Clean formed cavities of debris prior to placing concrete.
   1. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
   2. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

3.08 FORMWORK TOLERANCES

A. Construct formwork to maintain tolerances required by ACI 117, unless otherwise indicated.

B. Construct permanent insulated foam panel formwork to maintain tolerances required by ACI 301.

C. Construct and align formwork for elevator hoistway in accordance with ASME A17.1.

3.09 FIELD QUALITY CONTROL

A. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and to verify that supports, fastenings, wedges, ties, and items are secure.

B. Do not reuse wood formwork more than 4 times for concrete surfaces to be exposed to view. Do not patch formwork.

3.10 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.

B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

C. Store removed forms to prevent damage to form materials or to fresh concrete. Discard damaged forms.

END OF SECTION

SECTION 03200
CONCRETE REINFORCEMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Reinforcing steel for cast-in-place concrete.

B. Supports and accessories for steel reinforcement.

1.02 RELATED REQUIREMENTS

A. Section 03100 - Concrete Forms and Accessories.

B. Section 03300 - Cast-in-Place Concrete.

C. See Division 16 for Grounding and Bonding requirements.

1.03 REFERENCE STANDARDS

A. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International; 2010.

B. ACI 318 - Building Code Requirements For Structural Concrete and Commentary; American Concrete Institute International; 2011.

C. ACI SP-66 - ACI Detailing Manual; American Concrete Institute International; 2004.

D. ASTM A82/A82M - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement; 2007.

E. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 2012.

F. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2009a.

G. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel; American Welding Society; 2011.

H. CRSI (DA4) - Manual of Standard Practice; Concrete Reinforcing Steel Institute; 2009.

I. CRSI (P1) - Placing Reinforcing Bars; Concrete Reinforcing Steel Institute; 2011.

1.04 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Comply with requirements of ACI SP-66. Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.

C. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.

D. Reports: Submit certified copies of mill test report of reinforcement materials analysis.

1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301.
   1. Maintain one copy of each document on project site.

B. Provide Owner's representative with access to fabrication plant to facilitate inspection of reinforcement. Provide notification of commencement and duration of shop fabrication in sufficient time to allow inspection.

C. Welders' Certificates: Submit certifications for welders employed on the project, verifying AWS qualification within the previous 12 months.

D. Qualification of Workmen: Provide at least one person who shall be present at all times during execution of this portion of the work and who shall be thoroughly familiar with the type of materials being installed and the best methods for their installation and who shall direct all work performed under this section.

E. Codes and Standards: In addition to complying with all pertinent codes and regulations, comply with all pertinent recommendations contained under current editions of SP-66 ACI Detailing Manual and ACI 318 Building Code Requirements for Reinforced Concrete of the American Concrete Institute.

PART 2 PRODUCTS

2.01 REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M Grade 60 (420).
   1. Deformed billet-steel bars.
   2. Unfinished.

B. Stirrup Steel: ASTM A82/A82M steel wire, unfinished.

C. Reinforcement Accessories:
   1. Tie Wire: Annealed, minimum 16 gage.
   2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
   3. Provide stainless steel components for placement within 1-1/2 inches of weathering surfaces.

2.02 FABRICATION

A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.

B. Welding of reinforcement is permitted only with the specific approval of Owner's representative. Perform welding in accordance with AWS D1.4.

C. Locate reinforcing splices not indicated on drawings at point of minimum stress.
   1. Review locations of splices with Owner's representative.

PART 3 EXECUTION

3.01 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position.

B. Do not displace or damage vapor barrier.

C. Accommodate placement of formed openings.

D. Maintain concrete cover around reinforcing as follows:
   1. Beams:1-1/2 inch
   2. Column Ties: 1-1/2 inch.
   3. Walls (exposed to weather or backfill): 3 inch.
   4. Footings and Concrete Formed Against Earth: 3 inch.
   5. Slabs on Fill: 3 inch.

E. Conform to applicable code for concrete cover over reinforcement.

F. Bond and ground all reinforcement to requirements of Section 16 of these specifications.

3.02 FIELD QUALITY CONTROL

A. Owner's Representative, as specified in Section 01400, will inspect installed reinforcement for conformance to contract documents before concrete placement.

3.03 SCHEDULES

A. Reinforcement For Superstructure Framing Members: Deformed bars, unfinished.

B. Reinforcement For Foundation Wall Framing Members and Slab-on-Grade: Deformed bars and welded wire reinforcement.

END OF SECTION

SECTION 03300
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The requirements for providing all cast-in-place concrete and associated work in conformance with these specifications and as shown on the Drawings.

B. Concrete building members.

C. Concrete curing.

1.02 RELATED SECTIONS

A. Section 03200 - Concrete Reinforcement.

1.03 SUBMITTALS

A. Within 30 days after award of Contract, and at least 10 days before any concrete is placed, submit to the Owner's Representative the proposed design mix, together with testing results that establish the structural properties of each mix, for each class of concrete required for this portion of the work. Also submit the manufacturer's name and catalog number and certificate of compliance of items such as membranes, all admixtures, and the name and address of the proposed concrete supplier.

1.04 TEST AND INSPECTION REPORTS

A. The owner will perform all field testing for slump and entrained air and will take strength samples as required. Laboratory reports will be furnished to the Contractor.

1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI 318.

B. Qualifications of manufacturer: Ready-mix concrete plants shall be approved and certified by the National Ready Mix Concrete Association (NRMCA). Ready-mix concrete shall be batched in accordance with the applicable portions of ASTM Designation C94.

C. Qualification of Workmen:
   1. Provide at least one person who shall be present at all times during execution of this portion of the work and who shall be thoroughly trained and experienced in placing the types of concrete specified and who shall direct all work performed under this section.
   2. Thoroughly trained and experienced journeyman concrete finishers shall be responsible for finishing of exposed surfaces.

D. Codes and Standards: All concrete shall meet the requirements of the latest edition of the International Building Code 2009, and ACI 318 Building Code Requirements for Reinforced Concrete and ACI 301 Specifications for Structural Concrete for Buildings of the American Concrete Institute. Where provisions of pertinent codes, standards and this specification conflict, the more stringent provisions shall govern.

E. Follow recommendations of ACI 306R when concreting during cold weather.

1.06 PRODUCT HANDLING

A. A record of all deliveries shall be maintained by the contractor and available to the owner representative upon request. Any material found to be out of specification shall be rejected prior to use. If materials out of specification are found to have been used the associated cost of re-design or changes to correct the issue shall be solely at the cost of the contractor. Regardless of outcome any material found to be used that falls out of the specifications of this contract, in this section or any others, will be at the cost of the contractor, including installation and any associated fees to correct and reinstalled properly approved materials and shall be reflected as a credit upon payment of the related work.

B. Ready-mix concrete shall be placed in it's final position within 1-1/2 hours, or before the drum has revolved 300 revolutions, whichever comes first, after the introduction of the mixing water to the cement and aggregates, or the introduction of the cement to the aggregates.

C. Retempering: Concrete shall be mixed only in such quantities as are required for immediate use, and shall be used while fresh before initial set has taken place. Any concrete, which has developed initial set, shall not be used. Concrete, which has partially hardened, shall not be retempered or remixed.

D. Protection: Use all means necessary to protect cast-in-place concrete materials before, during, and after installation and to protect the installed work and materials of all other trades.

E. Replacement: In the event of damage, immediately make all repairs and replacements necessary and at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 FORMWORK

A. Formwork Design and Construction: Comply with guidelines of ACI 347 to provide formwork that will produce concrete complying with tolerances of ACI 117.

B. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.

C. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.

D. Form Ties: Cone snap type that will leave no metal within 1-1/2 inches of concrete surface.

2.02 REINFORCEMENT

A. Comply with requirements of Section 03200 Concrete Reinforcement.

2.03 CONCRETE MATERIALS

A. Cement: ASTM C 150, Type I - Normal Portland type. Provide Type I or III manufactured by one manufacturer.

B. Fine and Coarse Aggregates: ASTM C 33.

2.04 CHEMICAL ADMIXTURES

A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

B. All admixtures shall be completely compatible and shall be supplied by one manufacturer when possible.

C. Air Entrainment Admixture: ASTM C 260.

D. Chemical Admixtures: ASTM C 494/C 494M, Type A - Water Reducing, Type D - Water Reducing and Retarding, and Type E - Water Reducing and Accelerating.

E. Accelerators: Shall be approved by Owner's Representative prior to their use.

F. Retarders: Shall be approved by the Owner's Representative prior to their use.

G. Non-shrink Additives: By "Isovol", "Embeco", "Interplast N", or an approved mix design. The mix design shall be tested in accordance with ASTM C191 for workability, and ASTM C109 for compressive strength. The use of powdered aluminum will not be permitted.

2.05 MEMBRANES

A. Curing Membrane: 6-mil weight sheet plastic, a combination of sheet plastic and paper, or an equal approved in advance by the Owner's Representative.

B. Jointing Material: Cement of tape used for sealing membrane joints to be as recommended by the manufacturer of the membrane being joined.

2.06 OTHER MATERIALS

A. All other materials, not specifically described but required, for a complete and proper installation of cast-in-place concrete shall be as selected by the Contractor subject to the approval of the Owner's Representative.

2.07 MIXING

A. All concrete, unless otherwise specifically permitted by the Owner's Representative, shall be batched and mixed at one of the approved plants.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels, and dimensions before proceeding with work of this section.

B. Verify that all items to be embedded in concrete are in place, properly oriented, located and secured.

3.02 PREPARATION

A. Verify that forms are clean and free of rust before applying release agent.

B. Concrete forms, which have not been treated with oils, waxes or other bond breakers, shall be thoroughly wet prior to placing concrete.

C. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.

D. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

E. Discrepancies: In the event of discrepancy, immediately notify the Owner and Owner's Representative. Do not proceed with installation until all such discrepancies have been fully resolved.

3.03 PLACING CONCRETE

A. Notify Structural Engineer not less than 48 hours prior to commencement of placement operations.

B. General:

1. Concrete shall be placed as soon as possible after mixing and shall be plastic and readily workable when placed in the forms. Concrete which does not reach it's final position in the forms within 1-1/2 hours after adding cement shall not be used.
2. The method and manner of placing concrete shall avoid segregation of the aggregates, or displacement of reinforcement.
3. Conveyor belts, when used, shall be limited to approximately 300 feet in length to prevent segregation and shall be covered to protect the concrete from sun or rain.
4. Aluminum conduits of trims shall not be used for pumping or placing concrete.
5. Concrete shall be placed in continuous horizontal layers and so compacted that there will be no line of separation between layers. Care shall be taken to fill each part of the forms by depositing concrete directly or as near the final position as possible.
6. When concrete must be dropped more than five feet into the forms it shall be deposited through approved conduit. Approved conduit shall also be used to place concrete in sloping forms or in other locations as directed to prevent concrete from sliding around reinforcing or other embedments.
7. In general, the method of depositing and compacting concrete shall be conducted so as to form compact dense impervious concrete with the required surface and a minimum of segregation. Defective concrete shall be removed at the Contractor's expense. "Plastering" will not be permitted.

C. Cold Weather Placement: Concrete shall not be placed against frosted reinforcing steel or forms. Concrete shall not be mixed or placed while the atmospheric temperature is below 40 degrees F, unless cold weather concrete practices as required by ACI are followed.

D. Vibration of Concrete: The Contractor shall provide suitable internal vibrating tampers for use in placing and compacting all concrete except that which is placed under water. The vibrators shall be of the type designed to be placed directly in the concrete and their frequency of vibration shall not be less than 7,000 impulses per minute when in actual operation.
   1. Vibration shall be such that the concrete becomes uniformly plastic. Vibrators shall be inserted to depth sufficient to vibrate the bottom of each layer effectively but shall not be allowed to penetrate partially hardened concrete. The vibrators shall not be applied directly to steel which extends into partially hardened concrete. The intervals between points of insertion shall not be less than two feet nor more than three feet.
   2. Vibration shall not continue in any one spot to the extent that pools of grout are formed. In vibrating and finishing top surfaces which are exposed to weather or wear, extreme care shall be exercised to avoid drawing water or laitance to the surface. In relatively high lifts, the top layer shall be comparatively shallow and the concrete mix shall be as stiff as can be effectively vibrated into place; and properly finished. Vibrators shall not be used to transport or move concrete inside the form.
   3. The Contractor shall supply a sufficient number of vibrating tampers to effectively vibrate all of the concrete placed. Hand tamping shall be required wherever necessary to secure smooth and dense concrete on the outside surfaces.

3.04 CONCRETE FINISHING

A. Unformed Surfaces:
   1. The top surface of the footings shall be rodded across the screeds and smoothed with a "full float," light steel trowel. The general surface shall have no irregularities greater than 1/8-inch in depth or variations in grade of more than 1/4-inch in 10 feet.

B. Formed Surfaces:
   1. Unexposed Surfaces: The formed surface created by boards, plywood or steel sheets which may ultimately serve as a form for an addition concrete pour, or as an unexposed side of a pier. The surface may contain shear key, keyways, reinforcing steel, anchor bolts or other embedments as indicated on the drawings. The surface shall have no treatment except repairing rock pockets in excess of 3/4 inch deep and filling tie. The surface plane dimensions shall be within a tolerance of minus 1/4-inch or plus 1/2-inch of design dimensions.
   2. The surface shall be cleaned of laitance, dirt or other deleterious material to the satisfaction of the Owner's Representative prior to placing additional concrete or special coating.

C. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains as indicated on drawings.

3.05 CURING AND PROTECTION

A. All concrete surfaces shall be kept continuously wet with water for not less than three days after the concrete is placed. This curing may be done by covering the surfaces with sand, cotton mats, burlap, or white polyethylene sheeting or by wetting the outside surfaces of the forms.

B. Concrete designated to be painted shall not be coated with curing compounds.

C. If sand or cotton mats are used they shall be kept continuously wet day and night for the period of time specified above and if curing paper or plastic film is used it shall be left in place for the same length of time.

D. Curing paper and white polyethylene sheeting must be kept tightly in place by taping and weighting joints or other methods as the Contractor may devise for the prescribed length of time.

E. Sprinkling, ponding or covering material other than clean sand, cotton mats, curing paper or white polyethylene sheeting shall not be allowed.

F. Comply with requirements of ACI 308. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

G. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

3.06 FIELD QUALITY CONTROL

A. Inspections, tests and other quality assurance requirements shall be the responsibility of the Owner's Representative. The Owner shall maintain a quality control program.

3.07 DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

B. Repair or replacement of defective concrete will be determined by the Owner's Representative. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of the Owner's Representative for each individual area.

3.08 SCHEDULE - CONCRETE TYPES AND FINISHES

A. All concrete shall have the following minimum compressive strengths at 28 days and shall be proportioned within the following limits:
   1. Footings and Walls:
      a. Minimum psi @ 28 days, 4000 psi
      b. Minimum Sacks of Cement/C.Y., 5-1/2
      c. Maximum Slump, 4"
   2. Slabs:
      a. Minimum psi @ 28 days, 4000 psi
      b. Minimum Sacks of Cement/C.Y., 6.0
      c. Maximum Slump, 4", without the use of water reducing admixtures.
   3. Exterior Slabs:
      a. Minimum psi @ 28 days, 6000 psi
      b. Minimum Sacks of Cement/C.Y., 6-1/2
      c. Maximum Slump, 4", without the use of water reducing admixtures.

B. Entrained air is 5% to 8% for all concrete subject to freezing.

C. The minimum compressive strengths tabulated are the strength at 28 days for ordinary concrete or the strength at seven days for high-early strength concrete.

D. Maximum aggregate size shall not exceed 1-inch. Concrete made with less than 7/8-inch maximum size aggregate shall have an extra one-half sack of cement added to the minimum indicated in the table above.

END OF SECTION

SECTION 03350
CONCRETE FINISHING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finishing slabs on grade with a sealer/densifier/hardener, except areas to receive paint, that will react with concrete surfaces to produce a dense, hydrophobic, insoluble moisture barrier to seal out contaminants while hardening and densifying surface.

1.02 RELATED REQUIREMENTS

A. Section Cast-in-Place Concrete: Prepared concrete floors ready to receive finish.

B. Section 03100 - Concrete Forms and Accessories.

C. Section 03200 - Concrete Reinforcement.

1.03 REFERENCE STANDARDS

A. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International; 2005.

B. ACI 302.1R - Guide for Concrete Floor and Slab Construction; American Concrete Institute International; 2005

1.04 SUBMITTALS

A. See Section 01341 - Submittals, for submittal procedures.

B. Product Data: Provide data on concrete hardener and sealer, including information on compatibility of different products and limitations.

C. qualifications: Approved by manufacturer.

D. Project Information:
   1. Test Reports
   2. Certificate of rate of application

E. Warranty: Signed 10-year warranty.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's sealed packaging, including application instructions.

B. Store and handle to prevent damage to product and environment.

1.06 PROJECT CONDITIONS

A. Coordinate the work with concrete floor placement and concrete floor curing.

B. Verify concrete has been cured a minimum of 3 days.

C. Verify concrete is clean and free of membrane forming curing compounds and/or other sealers.

D. Verify concrete is free of laitance, grease, oil and contaminants.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Concrete Floor Finishes:
   1. L&M Construction Chemicals, Inc; Product SEAL HARD: www.lmcc.com.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that floor surfaces are acceptable to receive the work of this section.

B. Verify surfaces are clean and free of all contaminants and any film forming curing compounds or sealers.

C. Verify concrete has been cured a minimum of 3 days or as recommended by manufacturer before application.

D. Protect adjacent surfaces/areas from damage due to over spray, especially glass and painted surfaces.

E. Protect concrete from construction activity staining.

3.02 FLOOR SURFACE TREATMENT

A. Apply according to manufacturer's instructions.
   1. Apply directly from sealer container onto prepared surfaces, undiluted.
   2. Application equipment: Mechanical "walk-behind" or riding scrubber.
   3. Apply at minimum rate of 1 gallon per 150-200 sq. ft.
   4. Allow surfaces to remain wet with sealer for 30-60 minutes.
   5. Remove excess sealer at end of application procedure by water flushing and then squeegee dry.
   6. Apply in 1 coat.
   7. Apply 2 coats to floor areas that will be exposed to frequent oil or chemical spills.

END OF SECTION

SECTION 05120
STRUCTURAL STEEL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural steel framing members, support members.

B. Base plates

1.02 RELATED REQUIREMENTS

A. Section 05500 - Metal Fabrications: Steel fabrications affecting structural steel work.

1.03 REFERENCE STANDARDS

A. AISC (MAN) - Steel Construction Manual; American Institute of Steel Construction, Inc.; 2011.

B. AISC S303 - Code of Standard Practice for Steel Buildings and Bridges; American Institute of Steel Construction, Inc.; 2005.

C. AISC S348 - Specification for Structural Joints Using ASTM A325 or A490 Bolts; 2004.

D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2008.

E. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

F. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2012.

G. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

H. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2012.

I. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2010a.

J. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel; 2012.

K. ASTM A759 - Standard Specification for Carbon Steel Crane Rails; 2010.

L. ASTM E94 - Standard Guide for Radiographic Examination; 2004 (Reapproved 2010).

M. ASTM E709 - Standard Guide for Magnetic Particle Testing; 2008.

N. ASTM F436 - Standard Specification for Hardened Steel Washers; 2011.

O. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength; 2007a.

P. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society; 2012.

Q. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2010.

R. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; International Accreditation Service, Inc.; 2011.

1.04 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:
   1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
   2. Connections.
   3. Indicate cambers and loads.
   4. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.

C. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.

D. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

E. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.05 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC "Steel Construction Manual."

B. Comply with Section 10 of AISC "Code of Standard Practice for Steel Buildings and Bridges" for architecturally exposed structural steel.

C. Maintain one copy of each document on site.

D. Fabricator: Company specializing in performing the work of this section with minimum _____ years of documented experience.

E. Fabricator Qualifications: A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel (AC172).

F. Erector: Company specializing in performing the work of this section with minimum _____ years of documented experience.

G. Design connections not detailed on the drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in Alaska.

PART 2 PRODUCTS

2.01 MATERIALS

A. Steel Angles and Plates: ASTM A 36.

B. Steel Shapes, Plates, and Bars: ASTM A 242, corrosion-resistant structural steel.

C. Steel Plates and Bars: ASTM A572/A572M, Grade 42 (290) high-strength, columbium-vanadium steel.

D. Cold-Formed Structural Tubing: ASTM A500, Grade B.

E. Steel Plate: ASTM A 514.

F. Pipe: ASTM A 53, Grade B, Finish black.

G. Structural Bolts and Nuts: Carbon steel, ASTM A307, Grade A galvanized to ASTM A 153/A 153M, Class C.

H. Unheaded Anchor Rods: ASTM F1554, Grade 55, zinc coated, with matching ASTM A563 or A563M nuts and ASTM F436 Type 1 washers.

I. Welding Materials: AWS D1.1; type required for materials being welded.

J. Grout: Non-shrink, non-metallic aggregate type, complying with ASTM C1107/C1107M and capable of developing a minimum compressive strength of 7,000 psi at 28 days.

K. Touch-Up Primer for Galvanized Surfaces: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.02 ERECTION

A. Erect structural steel in compliance with AISC "Code of Standard Practice for Steel Buildings and Bridges".

B. Allow for erection loads, and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.

C. Field weld components indicated on shop drawings.

D. Use carbon steel bolts only for temporary bracing during construction, unless otherwise specifically permitted on drawings. Install high-strength bolts in accordance with AISCze "Specification for Structural Joints Using ASTM A325 or A490 Bolts".

E. Do not field cut or alter structural members without approval of Owner's representative.

F. After erection, repair welds, abrasions, and damage, with touch up primer for galvanized surfaces.

G. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.

3.03 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

3.04 FIELD QUALITY CONTROL

A. Except as noted below, Owner will retain an independent testing agency will perform field quality control tests, as specified in Section 01400.

B. High-Strength Bolts: Contractor shall provide testing and verification of field-bolted connections in accordance with AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts", testing at least 10 percent of bolts at each connection.

C. Welded Connections: Contractor shall visually inspect all field-welded connections and test at least 10 percent of welds using one of the following:
   1. Radiographic testing performed in accordance with ASTM E94.
   2. Ultrasonic testing performed in accordance with ASTM E164.
   3. Liquid penetrant inspection performed in accordance with ASTM E165.
   4. Magnetic particle inspection performed in accordance with ASTM E709.

END OF SECTION

SECTION 05500
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated steel, aluminum, and miscellaneous items.

1.02 RELATED REQUIREMENTS

A. Section 09900 - Paints and Coatings: Paint finish.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2008.

B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2012.

D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

E. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2012.

F. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength; 2012.

G. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2010.

H. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2010a.

I. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society; 2012.

J. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2010.

K. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; American Welding Society; 2008.

L. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; International Accreditation Service, Inc.; 2011.

M. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 2002 (Ed. 2004).

N. SSPC-SP 2 - Hand Tool Cleaning; Society for Protective Coatings; 1982 (Ed. 2004).

1.04 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

C. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.

D. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.05 QUALITY ASSURANCE

A. Design building under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in Alaska.

B. Fabricator Qualifications: A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel (AC172).

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A500, Grade B cold-formed structural tubing.

C. Plates: ASTM A283.

D. Pipe: ASTM A53/A53M, Grade B Schedule 40, hot-dip galvanized finish.

E. Bolts, Nuts, and Washers: ASTM A325 (ASTM A325M), Type 1, galvanized to ASTM A153/A153M where connecting galvanized components.

F. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

G. All steel components shall be hot-dip galvanized after fabrication.

H. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

D. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

E. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FABRICATED ITEMS

A. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; galvanized finish.

2.04 FINISHES - STEEL

A. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating.

B. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.05 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip galvanized where site welding is required.

B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Field weld components indicated on drawings.

D. Perform field welding in accordance with AWS D1.1/D1.1M.

E. Obtain approval prior to site cutting or making adjustments not scheduled.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 06050

WOOD, PLASTIC, AND COMPOSITE FASTENINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section includes: tie down fasteners, miscellaneous connectors for rough carpentry and miscellaneous fasteners for structural connections.

1.02 SUBMITTALS

A. Submit manufacturer's catalog, appropriate data sheets or specification sheets.

1.03 QUALITY ASSURANCE

A. All materials furnished under this section shall meet or exceed the referenced standards.

1.04 CODES AND STANDARDS

A. ICBO - International Conference of Building Officials Evaluation Report 1258 and NER-209.

B. IBC - International Building Code 2009.

PART 2 PRODUCTS

2.01 CONNECTORS

A. Acceptable Manufacturer: Simpson "Strong-Tie" or equal.

B. Finish: Hot Dip Galvanized. When applied against pressure treated lumber, ensure galvanization is designed for the corrosive properties of the specific chemicals used in the treated lumber.

2.02 NAILS AND BOLTS

A. In accordance with manufacturer's recommendations.

B. Use stainless steel or Galvanized nails, bolts, and connectors in association with treated wood. When applied against pressure treated lumber, ensure galvanization is designed for the corrosive properties of the specific chemicals used in the treated lumber.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install items as required by the drawings and in accordance with the manufacturer's requirements.

END OF SECTION

SECTION 06100
ROUGH CARPENTRY

PART 1GENERAL

1.01 SECTION INCLUDES

A. Structural framing and sheathing
B. Miscellaneous wood framing and sheathing.
C. Blocking and framing for wall and roof openings.
D. Concealed wood blocking for support of equipment.
E. Subflooring.
F. Underlayment

1.02 RELATED SECTIONS

A. Section 05500 – Metal Fabrication
B. Section 06200 – Finish Carpentry

1.03 REGULATORY REQUIREMENTS

A. Conform to the 2009 International Building Code (IBC).

1.04 REFERENCES

A. NDS – National Design Specification for Stress Grade Lumber and its fastening.
B. PS1 – Construction and Industrial Standards.
C. PS 20 – American Softwood Lumber Standard.
D. WCLIB – West Coast Lumber Inspection Bureau.
E. WWPA - Western Wood Product Association.

1.05 SUBMITTALS

A. Product Data: Submit manufacturer's specifications and installation instructions for the materials listed below:
   1. Sheathing.
   2. Underlayment.

1.06 PRODUCT HANDLING

A. Delivery and Storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and other panels; provide air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.
B. No wood shall be used were susceptible to wet locations or in direct contact with the process.

1.07 PROJECT CONDITIONS

A. Coordination: For carpentry work to other work, scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds and similar supports to attachment of other work by all trades.

PART 2PRODUCTS

2.01 MATERIALS

A. Lumber standards: Manufactured lumber to comply with PS 20 " American Softwood Lumber Standards" and with applicable grading rules of inspection and agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.
B. Inspection Agencies: Inspection agencies and the abbreviations used to reference with lumber grades and species include the following:
   1. WCLIB – West Coast Lumber Inspection Bureau.
   2. WWPA – Western Wood Products Associations.

C. Factory-mark each piece of lumber with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying agency, grade, species, moisture content at time of surfacing, and mill.
   1. For exposed lumber apply grade stamps to ends or back of each piece, or omit grade stamps entirely and issue certificate of grade compliance from inspection agency in lieu of grade stamp.

2.02 DIMENSIONAL LUMBER

A. Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS20, for moisture content specific for each use.
   1. Provide dresses lumber, S4S, unless otherwise indicated.
   2. Provide seasoned lumber with 19% maximum moisture content at time of dressing and shipment for sizes 2" or less in nominal thickness, unless otherwise specified.

B. For light framing (2” to 4” thick, 2” to 4” wide), provide the following grade and species:
   1. No 2 grade or better Hem Fir.

C. For structural light framing (2” to 4” thick, 2” to 4” wide), provide the following grade and species:
   1. No 1 grade or better Hem Fir.

D. For structural framing (2” to 4” thick, 2” to 5” and wider), provide the following grade and species:
   1. No 1 grade or better Hem Fir.

E. For exposed framing lumber provide material complying with the following requirements:
   1. Definition: Exposed framing refers to dimensional lumber which is not concealed by other work and is indicated to receive a stained or natural finish.
   2. Grading: Hand select material at factory from lumber of species and grade indicated below for compliance with “Appearance” grade requirements of ALSC National Grading Rule. Issue inspection certificate of inspection agency for selected material.

2.03 MISCELLANEOUS LUMBER

A. Provide wood for support or attachment of other work including cant strips, bucks, nails, blocking, furring, grounds, stripping and similar members. Provide lumber of sizes indicated, worked into shapes shown.

B. Moisture content: 19% maximum for lumber items not specified to receive wood preservative treatment.

C. Grade: standard grade light framing size lumber of any species or bard size lumber as required. No 3. common or standard grade boards per WCLIB or WWPA rules.

2.04 CONSTRUCTION PANELS

A. Construction Panel Standards: Comply with PS 1” US Product Standard for Construction and Industrial Plywood” for plywood panels and, for products not manufactured under PS1 provisions, with American Plywood Association (APA) “Performance Standard and Policies for Structural-Use Panels”, Form No E445.

B. Trademark: Factory-mark each construction panel with APA trademark evidencing compliance with grade requirements.

C. Concealed APA Performance-rated Panels: Where construction panels will be used for the following concealed types of applications, provide APA Performance-Rated Panels complying with requirements indicated for grade designations, span rating, exposure durability classifications, edge detail (where applicable) and thickness.
   1. Wall Sheathing: APA RATED SHEATHING
      a. Exposure Durability Classification: Exposure 1
      b. Thickness ½”
   2. Structural Plywood Subfloor: APA RATED SHEATHING
      a. Exposure Durability Classification: Exposure 1

b. Edge Detail: Tongue and Groove
c. Thickness: 1/2" for structural applications. See drawings for thickness at Architectural applications

3. Architectural Plywood Underlayment: APA UNDERLAYMENT WITH EXTERIOR GLUE
   a. Exposure Durability Classification: Exposure 1
   b. Thickness 1/2”

2.05 MISCELLANEOUS MATERIALS

A. Fasteners and Anchorages: Provide size, type, material and finish as indicated and as recommended by applicable standards, complying with applicable Federal Specification for nails, staples, screws, bolts, nuts, washers and anchoring devices. Provide metal hangers and framing anchors of the size and type recommended by the manufacturer for each use including recommending nails.
   1. In all locations, provide fasteners and anchorages with a hot dip zinc coating (ASTM A153).

B. Provide Simpson Strongtie Connectors for all framing connectors as indicated, or approved equal. Provide positive connections for all members utilizing either Simpson connectors or framed beam pockets, as indicated on the drawings.

C. Sill Gasket at Top of Concrete Curb: 1/4-inch (6mm) thick, plate width, closed cell plastic foam from continuous roll.

PART 3EXECUTION

3.01 GENERAL

A. Discard units of material with defects which might impair quality of work, and units which are too small to use in fabricating work with minimum joints or optimum joint arrangement.

B. Set carpentry work accurately to required levels and lines, with members plumb and true and accurately cut and fitted.

C. Securely attach carpentry work to substrate by anchoring and fastening as shown and as required by recognized standards.

D. Use common wire nails, unless as otherwise indicated. Use finishing nails for finish work. Select fasteners that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood; predrill as required.

E. Provide pressure-treated at all locations where materials are in contact with grade and other locations indicated on Contract Drawings and specified herein.

3.02 WOOD FRAMING

A. Provide framing members of sizes and on spacing shown, and frame openings as shown, or if not shown, comply with requirements of the IBC. Do not slice structural members between supports.

B. Anchor and nail as shown, and to comply with IBC minimum nailing requirements.

C. Firestop concealed spaces of wood framed walls and partitions at the ceiling lines. Where firestops are not automatically provided by the framing system used, use closely-fitted wood blocks of nominal two (2) inch thick lumber of the same width as framing members.

3.03 STUD FRAMING

A. General: Provide stud framing of size and spacing as indicated, or if not otherwise indicated, of the following sizes and spacing. Arrange studs so that the side face of the stud is perpendicular to direction of wall or partition and narrow face is parallel. Provide single bottom plate and double top plates using 2” thick nominal members with widths equaling that of studs; except single top plate may be used for non-load-bearing partitions. Nail or anchor plates to supporting construction.

B. Construct corners and intersections with not less than three (3) studs. Provide miscellaneous blocking and framing as shown and as required for support of facing materials, fixtures, specialty items and trim.
   1. Provide continuous horizontal blocking row in compliance with the requirements of the IBC, using two (2) inch thick members of same width as wall or partitions.

C. Frame openings with multiple studs and headers. Provide nailed headers members of thickness equal to width of studs. Set headers on edge and support on jamb studs.

3.04 INSTALLATION OF ACCESSORIES AND MISCELLANEOUS WOOD

A. Place sill gasket directly on cementitious foundation. Puncture gasket cleanly and fit tightly to protruding foundation anchor bolts.

B. Provide wood grounds, nailers, blocking and sleepers wherever shown and where required for attachment of other work. Form to shapes as shown and cut as required for true line and level of work to be attached. Coordinate location with other work involved.

C. Attach to substrates as required to support applied loading. Countersinking bolts and nuts flush with surfaces, unless otherwise shown.

D. Firestop concealed spaces of wood framed walls and partitions at the ceiling line and at ten (10) feet horizontally of the top story and use closely-fitted wood blocks of nominal two (2) inch thick lumber of the same width as framing members.

3.05 INSTALLATION OF CONSTRUCTION PANELS

A. General: Comply with applicable recommendations contained in Form No 30F, “APA Design/Construction Guide – Residential & Commercial,” for types of construction panels and applications indicated.

B. Fastening Methods
   1. Subflooring: Glue and nail to framing.
   2. Underlayment: Per flooring manufacturer’s recommendations, minimum glue and screw.
   3. Sheathing: Nail per nailing schedule.
   4. Plywood backing to panels: nail per diaphragm nailing.

C. Glue and nail subflooring plywood to substructure. Immediately before placing each sheet of subflooring, apply adhesive to substrate and contact side of subflooring. Nail with 10d nails at spacing as specified in drawings. Glue shall be applied at the rate of 1 gallon per 100 square feet.

D. Sheathing:
   1. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered. Fasteners as shown on drawings.
   2. Roof Sheathing: Secure panels perpendicular to framing members, with ends staggered and sheet ends over firm bearing.
      a. Nail panels to framing per nailing requirements noted on drawings.

END OF SECTION

SECTION 06176
WOOD I-JOISTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wood I-joists for floor framing.

B. Bridging, bracing, and anchorage.

C. Framing for openings.

1.02 RELATED REQUIREMENTS

A. Section 06100 - Rough Carpentry: Installation requirements for miscellaneous framing.

1.03 REFERENCE STANDARDS

A. ASTM D2559 - Standard Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions; 2012a.

B. ASTM D5055 - Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists; 2013.

C. PS 1 - Structural Plywood; 2009.

D. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; 2010.

1.04 DESIGN REQUIREMENTS

A. Design Floor Live Load: 125 lbs/sq ft with deflection limited to 1/500 of span.

1.05 SUBMITTALS

A. Product Data: Manufacturer's literature describing materials, dimensions, allowable spans and spacings, bearing and anchor details, bridging and bracing requirements, and installation instructions; identify independent inspection agency.

B. Shop Drawings: Indicate sizes and spacing of joists, bracing and bridging, bearing stiffeners, holes to be cut (if any), and framed openings between joists.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in manufacturer's original packaging with manufacturer's name and product identification intact and legible.

B. Protect products from damage due to weather and breakage.

C. Protect joists from warping or other distortion by stacking in upright position, braced to resist movement, with air circulation under coverings and around stacks.

D. Handle individual joists in the upright position.

PART 2 PRODUCTS

2.01 MANUFACTURERS

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. Wood I-Joists:
      a. Boise Cascade: www.bcrwp.com
      b. Georgia-Pacific Corporation: www.gp.com.
      c. Weyerhaeuser: www.woodbywy.com.

2.02 MATERIALS

A. Wood I-Joists: Laminated veneer lumber top and bottom flanges and plywood or oriented strand board (OSB) webs bonded together with structural adhesive, with published span rating to meet project requirements.
   1. Span Rating: Established and monitored in accordance with ASTM D5055 by APA - The Engineered Wood Association.
   2. Oriented Strand Board: Comply with PS 2.
   3. Plywood: Comply with PS 1.
   4. Adhesive: Tested for wet/exterior service in accordance with ASTM D2559.
   5. Depth: As indicated on drawings.
   6. Fabrication Tolerances:
      a. Flange Width: Plus/minus 1/32 inch.
      b. Flange Thickness: Minus 1/16 inch.
      c. Joist Depth: Plus 0, minus 1/8 inch.
   7. Marking: Mark each piece with depth, joist spacing, and allowable span for joist spacing.
   8. Provide bearing stiffeners if required by span rating or joist hanger manufacturer.

B. Wood Blocking, Plates, and Miscellaneous Framing: Softwood lumber, #2, construction grade, maximum moisture content of 19 percent.

C. Wood Blocking, Plates, and Miscellaneous Framing: As specified in Section 06100.

D. Fasteners: Hot-dip galvanized steel, type to suit application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that supports and openings are ready to receive joists.

B. Verify that field measurements are as indicated on shop drawings.

3.02 PREPARATION

A. Coordinate placement of support items.

3.03 ERECTION

A. Install joists in accordance with manufacturer's instructions.

B. Set structural members level and plumb, in correct position.

C. Make provisions for erection loads and for sufficient temporary bracing to maintain structure plumb and in true alignment until completion of erection and installation of permanent bracing.

D. Do not field cut or alter structural members without approval of Owner's representative.

E. Install permanent bridging and bracing.

F. Install headers and supports to frame openings required.

G. Frame openings between joists with lumber in accordance with Section 06100.

H. Coordinate installation of sheathing/decking with work of this section.

3.04 TOLERANCES

A. Framing Members: 1/4 inch maximum, from true position.

END OF SECTION

SECTION 06200
FINISH CARPENTRY

PART 1GENERAL

1.01 SECTION INCLUDES

A. Finish Carpentry Items.

B. Wood Trim.

1.02 RELATED SECTIONS

A. Section 06100 - Rough Carpentry

B. Section 08225 - Fiberglass Doors & Frames

C. Section 08561 - Tubular Plastic Windows

1.03 QUALITY ASSURANCE

A. Perform work in accordance with AWI Architectural Woodwork Quality Standards Illustrated, Custom Grade.

B. Plywood shall meet U.S. Product Standard PS-1 and be grade stamped by the American Plywood Association.

C. All millwork shall be kiln dried to a moisture content not to exceed 8%.

D. All interior millwork shall be belt or hand sanded.

1.04 SUBMITTALS

A. Shop Drawings: Indicate materials, component profiles and fastening methods to a minimum scale of 1-1/2 inch to 1 ft. (1:8).

1.05 DELIVERY, STORAGE AND PROTECTION

A. Keep all millwork and trim under cover, dry and fully protected.

B. Store trim inside an enclosed, dry heated building for at least two (2) weeks prior to installation.

PART 2PRODUCTS

2.01 LUMBER MATERIALS

A. Hardwood Lumber: Red Oak species, of quality suitable for transparent finish.

B. Softwood Lumber: Hemlock species, of quality suitable for transparent finish.

2.02 SHEET MATERIALS

A. Veneer Plywood shall be 3/4" thick, Red Oak veneer faced with exterior glue.

B. Plywood for mounting mechanical, electrical, and telephone equipment shall be 3/4" MDO B-B Group 2 EXT-APA, PSI-74 000 overlay both faces.

2.03 FASTENERS

A. Nails for trim and millwork shall be hot dipped galvanized or stainless steel, casing nails. Nailing shall be in an organized pattern.

B. Blind nail interior work insofar as possible.

C. Interior finish work shall be secured to studs, nailing blocks, etc.

D. Trim head screws with non-corrosive phosphate finish shall be used for attaching shelving, cabinets, wood trim, etc., to light gauge studs, metal door jambs or other metal backing.

E. Use galvanized nails for exterior work. Blind nail exterior work insofar as possible.

2.04 FABRICATION

A. All edges of finish pieces shall be slightly eased and sanded smooth.

B. Fill nail holes with:

1. One drop of Elmer's glue or equal and sand trim lightly to fill nail hole with sanding dust.

2. Color matched pre-manufactured nail putty.
3. Or accepted equal method of filling holes of items to be stained and varnished.

PART 3EXECUTION

3.01 EXAMINATION

A. Verify blocking and nailers are adequate and are properly installed before any finish or substrates are applied.

B. Coordinate with other trades to assure proper clearance and openings for equivalent.

C. Obtain Contracting Officer's acceptance of all millwork prior to painting or staining.

D. Verify that all moisture producing work has been completed at least two (2) weeks prior to millwork and trim installation.

3.02 INSTALLATION

A. Set and secure materials and components in place, plumb and level.

B. Fit and place all finish carpentry accurately and in a workmanlike manner. Gouges, dents, hammer marks, splits or other defects will not be permitted in the finish work.

C. Countersink all nail heads by use of a steel set or use a nail for setting.

D. At metal studs and hollow metal frames secured with trim head screws, countersink and fill.

E. Carefully scribe work abutting other components, with maximum gaps of 1/16" (2 mm). Do not use additional overlay trim to conceal larger gaps.

3.03 CLEANUP

A. Examine all work; repair or replace any damaged or split pieces.

B. Sand all edges and exposed ends of all pieces. Set all exposed nails and countersink all screws. Sand exposed work lightly to remove any rough spots, smooth skips.

C. Remove all work related debris.

D. Protect all exterior work from rain, spattered mud and from construction dirt until painted as scheduled.

END OF SECTION

SECTION 07212
BOARD AND BATT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board insulation and vapor retarder.

1.02 RELATED REQUIREMENTS

A. Section 03300 - Cast-In-Place Concrete

1.03 REFERENCE STANDARDS

A. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2012.

B. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2012.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2013a.

D. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2012.

1.04 SUBMITTALS

A. See Section 01341 - Submittals, for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

C. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver to project site in manufacturer's original unopened packages.

B. Label package wrappers and imprint insulation facing at 24 inch approximate spacing with brand name, insulation type, and thermal rating.

C. Store materials off ground.

D. Protect against damage and discoloration.

E. Immediately remove damaged or wet materials from job site.

F. Materials should be kept covered / protected from sun.

1.06 FIELD CONDITIONS

A. Do not install insulation when surface to receive insulation is wet or when surface and/or ambient air temperatures are lower than manufacturer's specified minimums.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Board Insulation: Subject to compliance with requirements, manufacturers offering products that may be incorpated into the work include, but are not limited to the following:
   1. Western Insulfoam Corp.; www.premier-industries.com
   2. DOW; www.dow.com
   3. Substitutions: See Section 01600 - Product Requirements.

B. Batt/Acoustical Insulation: Subject to compliance with requirements, manufacturers offering products that may be incorpated into the work include, but are not limited to the following:
   1. Owens Corning Corp.; www.owenscorning.com
   2. Johns Manville; www.jm.com
   3. CertainTeed Corporation; www.certainteed.com

2.02 APPLICATIONS

A. Insulation Under Concrete Slabs: Expanded polystyrene board.

B. Insulation at Perimeter of Foundation: Expanded polystyrene board.

2.03 FOAM BOARD INSULATION MATERIALS

A. Expanded Polystyrene Board Insulation: ASTM C578; with the following characteristics:
   1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
   2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
   3. Board Size: 48 x 96 inch.
   4. Board Thickness: 2 inches.
   5. Board Edges: Square.
   6. Water Absorption: 3 percent by volume, maximum, when tested In accordance with ASTM C272.
   7. Board Density: 0.9 lb/cu ft.
   8. Compressive Resistance: 40 psi in accordance with ASTM D1621.
   9. Manufacturers:
      a. Dow Chemical Co., www.dow.com.
      b. Western Insulfoam Corporation, www.premier-industries.com.

2.04 ACCESSORIES

A. Sheet Vapor Retarder: Black polyethylene film for below grade application, 10 mil thick.

B. Adhesive: Type recommended by insulation manufacturer for application.

C. Adhesive: Gun grade, mastic type, compatible with insulation and substrate

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation .

B. Verify substrate surfaces are flat, free of irregularities or materials or substances that may impede adhesive bond.

C. Remove, or protect against, projections that may damage insulation or prevent proper installation.

D. Verify that work of preceding trades is completed.

3.02 BOARD INSTALLATION AT FOUNDATION PERIMETER

A. Adhere a 6 inch wide strip of polyethylene sheet over construction joints with double beads of adhesive each side of joint.
   1. Tape seal joints.
   2. Extend sheet full height of joint.

B. Install boards horizontally on foundation perimeter.
   1. Place boards to maximize adhesive contact.
   2. Install in running bond pattern.
   3. Butt edges and ends tightly to adjacent boards and to protrusions.

C. Allow no more than 1/8 inch space between boards.

D. Extend boards over expansion joints, unbonded to foundation on one side of joint.

E. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.03 BOARD INSTALLATION UNDER CONCRETE SLABS

A. Place insulation under slabs on grade after base for slab has been compacted.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

C. Prevent insulation from being displaced or damaged while placing vapor retarder subsequent fill and slab.

3.04 PROTECTION

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

3.05 CLEANING

A. Including work of other trades, clean, repair and touch-up or replace, when directed, products that have been soiled, discolored or damaged by work of this section.

B. Remove debris from project site upon work completion, or sooner if directed.

END OF SECTION

SECTION 07900
JOINT SEALERS

PART 1GENERAL

1.01 SECTION INCLUDES

A. Sealants and joint backing.

1.02 REFERENCES

A. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2002.

1.03 SUBMITTALS

A. Product Data: Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.

B. Manufacturer's Installation Instructions: Indicate special procedures, surface preparation, and perimeter conditions requiring special attention.

C. Provide certification for test rating, UL 729-79 for fire resistant sealants.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.

B. Applicator Qualifications: Company specializing in performing the work of this section with minimum three (3) years experience.

C. Conform to SWRI requirements for materials and installations.

1.05 ENVIRONMENTAL REQUIREMENTS

A. The installer must examine the joint surfaces and backing, and the conditions under which the joint sealer work is to be performed, and notify the Contractor in writing of conditions detrimental to the proper performance of the sealers. Do not proceed with the joint sealer work until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

B. Weather Conditions: Do not proceed with installation of sealants under adverse weather conditions, or when temperatures are below manufacturer's recommended limitations for installation. Proceed with the work only when forecast weather conditions are favorable for proper cure and development of high early bond strength. Wherever joint width is affected by ambient temperature variations, install elastomeric sealants only when temperatures are in the lower third of manufacturer's recommended installation temperature range.

C. Do not install solvent curing sealants in enclosed building spaces.

D. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.06 COORDINATION

A. Coordinate the work with all sections referencing this section.

PART 2PRODUCTS

2.01 MANUFACTURERS

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. Tremco Commercial Sealants; www.tremcosealants.com.
   2. GE Plastics; www.geplastics.com.
   3. DOW Corning; www.dow.com.

2.02 SEALANTS

A. Sealants and Primers - General: Provide only products having lower volatile organic compound (VOC) content.

B. Sealant shall be specifically designed for application to the surfaces as shown on the drawings, and shall be nonsag with integral non-fading colors.

C. Interior silicone sealants shall be synthetic silicone rubber base component type conforming to Federal Specifications TT-S-1543 (a) Class A.

D. Pro-Seal 34 polycarbonate, single component, non-sag elastomeric copolymer sealant is to be used as an exterior sealant.

2.03 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: Round foam rod compatible with sealant; ASTM D1667, closed cell PVC; oversized 30% to 50% larger than joint width.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

B. Verify that joint backing and release tapes are compatible with sealant.

3.02 PREPARATION

A. Remove loose materials and foreign matter which might impair adhesion of sealant.

B. Clean and prime joints in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Protect elements surrounding the work of this section from damage or disfigurement.

3.03 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C1193.

C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.

D. Install bond breaker where joint backing is not used.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

G. Tool joints concave.

3.04 CLEANING

A. Clean adjacent soiled surfaces.

3.05 PROTECTION OF FINISHED WORK

A. Protect sealants until cured.

3.06 SCHEDULE

A. Acoustic Sealants shall be applied at unexposed joints of all sound walls noted on Drawings to prevent transmission of airborne sound.

B. Sanitary Sealant shall be applied where noted on the Drawings or as required to provide sanitary treatment of joints in toilet and kitchen areas.

C. Fire resistant sealant shall be used wherever penetrations in rated assemblies occur, to seal and preserve rating. Other sealants shall be used as follows:
   1. Exterior Locations:Type:Color:
      a. Windows and DoorsProSeal 34Match adjacent surfaces
   2. Interior Locations:Type:Color:
      a. Windows and DoorsSiliconeMatch adjacent finish
      b. Wall and Ceiling JointsAcrylic LatexMatch adjacent finish
      c. Toilet RoomsPolyseam SealWhite
      d. AcousticalTremco AcousticalDark Gray

END OF SECTION

SECTION 08225
FIBERGLASS DOORS AND FRAMES

PART 1GENERAL

1.01 SECTION INCLUDES

A. Fiberglass reinforced plastic (FRP) doors.

B. Frames for fiberglass reinforced plastic doors.

C. Hinges and other door hardware.

D. Glazing.

E. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 08710 - Door Hardware

B. Section 13121 - Pre-Engineered Buildings

1.03 REFERENCE STANDARDS

A. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2010.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2013a.

C. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2013.

D. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

E. UBC Std 7-2 - Fire Tests of Door Assemblies; 1997.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Obtain hardware templates from hardware manufacturer prior to starting fabrication.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's standard details, installation instructions, hardware and anchor recommendations, and description of molding process.

B. Test Reports: Show compliance with specified criteria.

C. Shop Drawings: Show layout and profiles; include assembly methods.
   1. Indicate product components, including hardware reinforcement locations and preparations, accessories, finish colors, patterns, and textures.
   2. Indicate wall conditions, door and frame elevations, sections, materials, gages, finishes, location of door hardware by dimension, and details of openings; use same reference numbers indicated on Drawings to identify details and openings.
   3. Specifications relating to FRP door thickness, resin type, core material, method of construction, finish color, type of glass and glazing, anchor systems, joint construction and complete warranty information.
   4. Complete schedules or drawings of FRP doors and frames (and associated Builders Hardware) showing identifying mark numbers, door and frame types, typical elevations, nominal sizes, handing, actual dimensions and clearances, and required hardware preps and reinforcements.
   5. Supporting reference drawings pertaining to frame mounting details, door light or louver installation, hardware locations, and factory hardware cutouts and reinforcement.

D. Color Samples: Submit one (1) complete set of color chips, illustrating manufacturer's available finishes, colors, and textures.

E. Verification Samples: Submit door surface samples for each finish specified, 10 inch by 10 inch in size, illustrating finishes, colors, and textures.

F. Door Corner Sample: Submit corner cross sections, 10 inch by 10 inch in size, illustrating construction, finish, color, and texture.

G. Maintenance Data: Include instructions for repair of minor scratches and damage.

H. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer; include detailed terms of warranty.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01600 - Product Requirements, for additional provisions.
   2. Package products with protective covering and identify with descriptive labels.

J. Production of FRP doors and frames shall not proceed until final approval of submittals.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than five years of documented experience.

B. Where "labeled fire doors are required, fiberglass doors and frames shall be UL listed and shall be tested successfully to UL10B/UL10C, UBC 7-2 standards.

C. Certify that FRP doors are manufactured via press-molding technology.

D. Manufacturer will certify exterior doors are energy rated to a U-value of 0.35. Any exterior door glazing will be rated to a U-value of 0.20.

E. Provide written limited guarantee for FRP doors and frames as follows:
   1. Non-fire labeled doors: Doors are guaranteed for the life of the product against delamination and failure due to corrosion from specific chemical environment named at the time of purchase.
   2. Doors to be guaranteed to meet the door industry standards for flatness for the life of the product.
   3. All products guaranteed against defective workmanship for a period of ten (10) calendar years after the date of purchase.
   4. Fiberglass frames and windows, welded corners and chemically bonded hinge reinforcements guaranteed for the life of the product against failure due to corrosion from specific chemical environment named at the time of purchase.

F. Installer Qualifications: Company specializing in installing products of the type specified in this section with not less than five years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Mark doors with location of installation, door type, color, and weight.

B. Deliver materials in manufacturer’s original, unopened, undamaged containers with identification labels intact.

C. Store materials in original packaging, under cover, protected from exposure to harmful weather conditions and from direct contact with water.
   1. Store at temperature and humidity conditions recommended by manufacturer.
   2. Do not use non-vented plastic or canvas shelters or wrap.
   3. Immediately remove wet wrappers.

D. Store vertically, elevated minimum 4 inches above grade, with minimum 1/4 inches space between doors.

1.08 FIELD CONDITIONS

A. Do not install doors until structure is enclosed.

B. Maintain temperature and humidity at manufacturer's recommended levels during and after installation of doors.

1.09 WARRANTY

A. See Section 01780 - Closeout Submittals, for additional warranty requirements.

B. Provide five (5) year manufacturer warranty covering materials and workmanship, including degradation or failure due to chemical contact.

PART 2PRODUCTS

2.01 MANUFACTURERS

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. Molded Fiberglass Doors:
      a. ChemPruf Door Company, Ltd None - N/A: www.chem-pruf.com.
   2. Substitutions: Not permitted.

2.02 DOOR AND FRAME ASSEMBLIES

A. Door and Frame Assemblies: Factory-fabricated, prepared and machined for hardware.
   1. Door and frame pre-assembled; shipped with braces, spreaders, and packaging as required to prevent damage.
   2. Mechanical Durability: Tested to ANSI A250.4 Level A (1,000,000 cycles), minimum; tested with hardware and fasteners intended for use on project.
   3. Screw-Holding Capacity: Tested to 900 psi, minimum.
   4. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less; when tested in accordance with ASTM E84.
   5. Flammability: Self-extinguishing when tested in accordance with ASTM D635.
   6. Chemical Resistance: Resist degradation due to exposure to tap water, distilled water, and:
      a. Chlorine-treated moisture in air.
      b. Ocean salt spray.
   7. Provide products that meet USDA requirements for incidental food contact.
   8. Sizes: As indicated on drawings.
   9. Clearance Between Door and Frame: 1/8 inch, maximum.
   10. Clearance Between Meeting Stiles of Pairs of Doors: 1/8 inch, maximum.
   11. Clearance Between Bottom of Door and Finished Floor: 3/4 inch, maximum; not less than 1/4 inch clearance to threshold.
   12. All Fasteners: Stainless steel, type 304.
   13. Provide frame anchors that allow for variation in rough opening size; do not field cut doors or frames to fit.

B. Fire Rated Doors and Frames: Ratings indicated on drawings.
   1. Tested in accordance with UL 10C or UBC Standard 7-2 ("positive pressure").
   2. UL labeled.
   3. No visible seals when door is open.
   4. Provide mineral or intumescent core as required to achieve fire rating.

2.03 COMPONENTS

A. Interior Doors: Medium Duty Series.
   1. Thickness: 1-3/4 inches (44 mm), overall.
   2. Door Construction: Pultruded Fiberglass Channel
   3. Door facings shall be random chopped fiberglass roving.
   4. Hardware Preparations: Factory reinforce, machine, and prepare for all hardware including field installed items; provide solid blocking for each hardware item; make field cutting, drilling or tapping unnecessary; obtain manufacturer's templates for hardware preparations.
   5. Color: See drawings.

B. Exterior Doors: Heavy Duty Series.
   1. Thickness: 1-3/4 inches, overall.
   2. Door Construction: Seamless press-molded construction, high-modular pultruded FRP square or rectangular subframe, triangular shaped 3/8" cell phenolic resin impregnated

kraft honeycomb or plastic honeycomb with face scrim core, high modular pultruded tubular FRP, high-density polymer compression blocks, or plastic compression blocking at all hardware locations, and corner locations. A minimum of 900 lbs of pullout strength is required for each factory supplied hinge screw.

3. Door facings shall utilize a chemical resistant thermosetting polyester resin system with fiber reinforcing layers
   a. Chopped strand mat layers used to provide bond integrity between gelcoat, laminated facings and the internal door structure.
   b. Structural reinforcement shall be in the form of a knitted multi-layer material with layers of uni-directional glass fiber oriented in both the vertical and horizontal directions for high stiffness, impact resistance and resistance to warping.
4. Exposed FRP door faces to have integrally molded 25/30 mils thick (wet) ultra-violet light stabilized marine grade NPG-isophthalic polyester gelcoat or industrial chemical coating color topcoat. Facings to be slightly textured semi-gloss finish. Face color to be selected from manufacturer's available colors. Gelcoat may not be sprayed onto the door face as a secondary coating.
5. Subframe and Reinforcements: Fiberglass pultrusions or polymer foam; no metal or wood.
6. Waterproof Integrity: All edges, cut-outs, and hardware preparations factory fabricated of fiberglass reinforced plastic; provide cut-outs with joints sealed independently of glazing or louver inserts or trim.
7. Hardware Preparations: Factory reinforce, machine, and prepare for all hardware including field installed items; provide solid blocking for each hardware item; make field cutting, drilling or tapping unnecessary; obtain manufacturer's templates for hardware preparations.
8. Gel Coating: Ultraviolet stabilized polyester, marine grade NPG-isophthalic, with slightly textured semi-gloss final finish.
9. Gel Coating Thickness: Minimum 15 mils wet, plus/minus 3 mils.
10. Gel Coating Color: As selected from manufacturer's standard colors.

C. Frames: Profiles and dimensions as indicated on drawings; same type and construction used in mechanical durability test for doors.
   1. High-modular pultruded structural FRP shape. Standard double rabbeted 5-3/4" deep x 2" face, 3/16" thick, with integral 5/8" door stop with 1 15/16" soffits, to match typical hollow metal configurations.
   2. Construction for Fire-Rated Doors: Provide frames bearing labels to match doors; use one of the following:
      a. Galvanized steel, hot-dipped coated to G180/Z285 or ASTM A123/A123 M; 18 gage, 0.05 inch minimum thickness; degreased and primed for field painting.
      b. Stainless steel, Type 304; 18 gage, 0.05 inch minimum thickness; No.4 satin brushed finish.
      c. Fiberglass pultrusions primed for field painting.
   3. Corner Joints: Mitered with concealed corner blocks or angles of same material as frame; fiberglass and aluminum joined with screws; steel and stainless steel spot welded; sealed watertight with silicone sealant.
   4. Hardware Reinforcements: FRP reinforcing shall be chemically welded to door frame material at required locations. Minimum screw pullout strength of 1100 lb per #12 x 1" sheet metal screw is required.
   5. At hardware cut-outs provide continuous backing or mortar guards of same material as frame, sealed watertight.
   6. Frame Anchors: Stainless steel, Type 304; provide 3 anchors in each jamb for heights up to 84 inches with one additional anchor for each additional 24 inches in height.
   7. Frames shall have a factory applied industrial urethane chemical coating color topcoat, to match the color and sheen of the doors. Gelcoat may not be sprayed onto the frame as a secondary coating.

D. Transom and Other Panels: Same construction as doors.

2.04 ACCESSORIES

A. Astragals for Inactive Leaves: Pultruded fiberglass angle or tee; same color as gel coat.

B. Glazing and Louver Stops: Pultruded fiberglass unless otherwise indicated or required by fire rating; provided by door manufacturer to fit factory made openings, color and texture to match door; fasteners not penetrating waterproof integrity.
   1. Exterior Doors: Provide non-removable stops on outside and continuous compression gasket weatherseal.
   2. Glazed Openings: Provide removable stops on one side.
   3. Fire-Rated Doors: Provide stop kit listed by labeling authority.
   4. Opening Sizes: As indicated on drawings.

C. Glazing: Laminated safety glass, 1/4 inch thick, with minimum 0.030 inch thick interlayer, clear.

D. Louvers for Non-Fire-Rated Doors: Same materials, construction, finish, and color as door; fixed vanes, 45 degree sloped vanes.

E. Louvers for Fire-Rated Doors: UL labeled self-closing fire damper louvers actuated with fusible link; galvanized steel with overlapping trim frame both sides of door.

F. Hardware: As specified in Section 08710.

PART 3EXECUTION

3.01 EXAMINATION

A. Verify actual dimensions of openings by field measurements before door fabrication; show recorded measurements on shop drawings.

B. Do not begin installation until substrates have been properly prepared.

C. If substrate preparation is the responsibility of another installer, notify Owner's representative of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

B. Clean and prepare substrate in accordance with manufacturer's directions.

C. Protect adjacent work and finish surfaces from damage during installation.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions; do not penetrate frames with anchors.

B. Install fire-rated assemblies in accordance with NFPA 80.

C. Set units plumb, level, and true-to-line, without warping or racking doors, and with specified clearances; anchor in place.

D. In stud walls, install frames prior to building walls; anchor frames to studs using concealed anchors.

E. Repair or replace damaged installed products.

3.04 ADJUSTING

A. Lubricate, test, and adjust doors to operate easily, free from warp, twist or distortion, and to fit watertight for entire perimeter.

B. Adjust hardware for smooth and quiet operation.

C. Adjust doors to fit snugly and close without sticking or binding.

3.05 CLEANING

A. Clean installed products in accordance with manufacturer’s instructions prior to owner’s acceptance.

3.06 PROTECTION

A. Remove temporary coverings and protection of adjacent work areas.

B. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Repair or replace damaged installed products.

C. Protect adjacent work areas and finish surfaces from damage during installation.

D. Protect installed products from damage during subsequent work.

END OF SECTION

SECTION 08331
OVERHEAD COILING DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Overhead coiling doors , operating hardware, non-fire-rated and exterior, manual operation.

1.02 RELATED REQUIREMENTS

A. Section 05500: Metal Fabrications: Support framing.

B. Section 08710 - Door Hardware: Cylinder cores and keys.

C. Section 06200 - Finish Carpentry

D. Section 13121 - Pre-Engineered Buildings

1.03 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2011.

B. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2010.

C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2013.

D. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.

E. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Overhead Coiling Doors:
   1. Overhead Door Corporation,
   2. Substitutions: See Section 01600 - Product Requirements.

2.02 COILING DOORS

A. Exterior Coiling Doors: Steel slat curtain.
   1. Capable of withstanding positive and negative loads per structural design criteria without undue deflection or damage to components.
   2. Single thickness slats.
   3. Sandwich slat construction with insulated core of rigid type insulation; insulation (u-.13) value: 0.50 BTU/hr sq ft deg F
   4. Finish: Factory painted, see drawings for color.
   5. Hood Enclosure: Manufacturer's standard; primed steel.
   6. Manual hand chain lift operation.
   7. Mounting: Within framed opening.
   8. Exterior lock and latch handle.

2.03 MATERIALS

A. Curtain Construction: Interlocking slats.
   1. Slat Ends: Alternate slats fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
   2. Curtain Bottom: Fitted with angles to provide reinforcement and positive contact in closed position.

3. Weatherstripping: Moisture and rot proof, resilient type, located at jamb edges, bottom of curtain, and where curtain enters hood enclosure of exterior doors.

B. Steel Slats: Minimum 16 gage ASTM A653/A653M galvanized steel sheet.

C. Guide Construction: Continuous, of profile to retain door in place with snap-on trim, mounting brackets of same metal.

D. Hood Enclosure: Internally reinforced to maintain rigidity and shape.

E. Roller Shaft Counterbalance: Steel pipe and helical steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb nominal force to operate.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that opening sizes, tolerances and conditions are acceptable.

B. Examine conditions of substrates, supports, and other conditions under which this work is to be performed.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

E. Coordinate installation of sealants and backing materials at frame perimeter as specified in Section 07900.

F. Install perimeter trim, closures, and weather stripping.

G. Instruct Owner's personnel in proper operating procedures and maintenance schedule.

3.03 TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent work.

B. Maximum Variation From Plumb: 1/16 inch.

C. Maximum Variation From Level: 1/16 inch.

D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 ft straight edge.

3.04 ADJUSTING

A. Adjust operating assemblies for smooth and noiseless operation.

3.05 CLEANING

A. Clean installed components.

B. Remove labels and visible markings.

3.06 PROTECTION

A. Protect installed products until completion of project.

END OF SECTION

SECTION 08561
TUBULAR PLASTIC WINDOWS

PART 1GENERAL

1.01 SECTION INCLUDES

A. Factory fabricated tubular extruded vinyl (PVC) windows.

B. Glass and glazing.

C. Operating hardware.

D. Insect screens.

E. Perimeter sealant.

1.02 RELATED REQUIREMENTS

A. Section 07900 - Joint Sealers

B. Section 13121 - Pre-Engineered Buildings

1.03 REFERENCE STANDARDS

A. AAMA/WDMA/CSA 101/I.S.2/A440 - Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors; American Architectural Manufacturers Association; 2005.

1.04 SUBMITTALS

A. Product Data: Provide component dimensions, anchorage and fasteners, hardware, glass, internal drainage details and manufacturer's standard installation instructions.

B. Shop Drawings: Indicate opening dimensions, framed opening tolerances, affected related work, installation requirements, and weatherstripping.

C. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

D. Operation and Maintenance Manual: Indicate manufacturer, type, style, accessory list and finishes for each type of window provided. Include manufacturer's recommended maintenance and adjustment procedures.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five (5) years of documented experience.

B. All windows shall be marked with an AAMA certification label in accordance with requirements of the applicable referenced standard.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver windows to project site in undamaged condition; handle windows to prevent damage to components and finishes.

B. Store windows out of contact with ground. Protect windows from weather and construction traffic in well ventilated area.

1.07 WARRANTY

A. Provide manufacturer's warranty against water leakage, air infiltration, finish deterioration and faulty operation.

PART 2PRODUCTS

2.01 MANUFACTURERS

A. Tubular Plastic Windows: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include, but are not limited to the following:
   1. Alside, Inc; Product A682, 80 Series: www.alside.com.
   2. Northerm Windows; Product Model 3255, Flex-lox Series: www.cgnw.com.

2.02 COMPONENTS

A. Frame: PVC extrusions, fusion-welded construction, mitered corners, 3 3/8" frame depth with:
   1. Welded nailing fin with 1 3/8" setback.
   2. Internal weepage system shall be incorporated.
   3. Size and shape: see drawings.
   4. Color: White.

B. Sash: PVC extrusions, fusion-welded construction, mitered corners, operable sash unit with single-handle multi-point locking system, positive-action rotary-crank operator system, with handle.

C. Insect Screen Frame: Rolled aluminum frame of rectangular sections; secured with continuous vinyl gasket; nominal size similar to operable glazed unit.

2.03 GLASS AND GLAZING

A. Glazing: Low-E sealed insulating glass unit, 1 inch unit thickness with argon gas fill.

B. Sealed Insulating Glass Units: Conform to ASTM E774, Level CBA.

C. Thermal Performance (Low-E Glazing with argon gas fill), in accordance with NFRC 100-97: U-value = 0.20.

D. Solar Heat Gain Coefficient (Low-E Glazing with argon gas fill), in accordance with NFRC 200-97: 0.27.

E. Visible Light Transmittance (Low-E Glazing with argon gas fill), in accordance with MFRC 300-97: 0.51.

F. Sound Transmission Class rating for DS/DS: 31.

2.04 FABRICATION

A. Assemble units completely in factory, including operating hardware and glazing.

PART 3EXECUTION

3.01 EXAMINATION

A. Verify that openings are in correct location, of correct size, in accordance with approved shop drawings and manufacturer's installation instructions.

B. Verify that surfaces and openings to receive windows are square, plumb, rigid and free of debris.

C. Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this Section.

D. Prior to starting work, notify Contractor about defects requiring correction.

E. Beginning construction activities of this section indicates installer's acceptance of conditions.

3.02 INSTALLATION

A. Install window units square, plumb and level in accordance with approved shop drawings and manufacturers instructions.

B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

C. Secure with non-corrosive concealed fasteners.

D. Operating panels to be closed and locked during installation. Set units plumb, level and true to line without warp or rack of frames or sash. Provide proper support and anchor securely in place.

E. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

F. Coordinate attachment and seal of perimeter air and vapor barrier materials.

G. Install perimeter sealant and backing materials in accordance with Section 07900.

H. Energy rating label to remain on windows until substantial completion inspection.

3.03 ADJUSTING

A. Adjust hardware for smooth operation and secure weathertight closure.

3.04 CLEANING

A. Clean interior and exterior surfaces free of labels, mortar, plaster, paint, joint sealers and other foreign matter to prevent damage to weatherstrip and to prevent interference with operation of hardware.

B. Wash surfaces by method recommended and acceptable to sealant and window manufacturer; rinse and wipe surfaces clean.

C. Leave interior surfaces ready for finishing specified by drawings.

3.05 PROTECTION

A. Protect ventilators and operating parts from dirt and damage caused by subsequent construction activities.

END OF SECTION

SECTION 08710
DOOR HARDWARE

PART 1GENERAL

1.01 SECTION INCLUDES

A. Hardware for FRP (fiberglass) doors.

B. Thresholds.

C. Weatherstripping, seals and door gaskets.

1.02 RELATED SECTIONS

A. Section 08225 - Fiberglass Doors and Frames.

1.03 REFERENCES

A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2003.

B. NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association; 2007.

C. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures; National Fire Protection Association; 2006.

D. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.

E. DHI - Door and Hardware Institute

1.04 SUBMITTALS

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Include installation details, material descriptions, dimensions of individual components, profiles, and finishes.

C. Door Hardware Schedule:
   1. Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, and, function and finish of door hardware.
   2. Format to comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule".
   3. Include the following content:
      a. Type, style, function, size, label, hand and finish of each door hardware item.
      b. Manufacturer name of each item.
      c. Fastenings and other pertinent information.
      d. Location of each door hardware set, cross referenced to Drawings, both on floor plans and in door and frame schedule.
      e. Explanation of abbreviations, symbols and codes contained in schedule.
      f. Door and frame sizes and materials.

D. Maintenance Data: Include data on operating hardware, lubrication requirements and inspection procedures related to preventative maintenance.

1.05 QUALITY ASSURANCE

A. Hardware Supplier Qualifications: Company specializing in supplying commercial door hardware with three (3) years of experience.
   1. Scheduling Responsibility: Preparation of door hardware and keying schedules.

B. Hardware Supplier Personnel: Employ an Architectural Hardware Consultant (AHC) or person with comparable experience to assist in preparation of the work in this section.

C. Installer Qualifications: An installer with three (3) years minimum experience; and who has completed door hardware similar in material, design and extent to that indicated for this Project

and whose work has resulted in construction with a record of successful in-service performance.

D. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.

E. Regulatory Requirements: Comply with provisions of the following:
   1. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)", as follows:
      a. Handles, Pulls, Latches, Locks, and Other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.

1.06 DELIVERY, STORAGE, AND PROTECTION

A. Deliver materials in manufacturer's original containers with identification labels intact.

B. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

C. Package hardware items individually; label and identify each package with door opening code to match hardware schedule and include basic installation instructions with each item or package.

1.07 COORDINATION

A. Coordinate the work with other directly affected sections involving manufacture or fabrication of internal reinforcement for door hardware.

B. Templates: Within ten (10) days after receipt of approved hardware schedule obtain and distribute to the parties involved; templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

C. Coordinate Owner's keying requirements during the course of the Work and prior to procurement of final lock cylinder cores.

1.08 WARRANTY

A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
   1. Structural failures including excessive deflection, cracking, or breakage.
   2. Faulty operation of operators and door hardware.
   3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

C. Warranty Period: One year from the date of Substantial Completion, unless otherwise indicated.

D. Warranty Period for Manual Closers: Ten (10) years from date of substantial completion.

E. Warranty Period for Locksets: Ten (10) years from date of substantial completion.

1.09 MAINTENANCE PRODUCTS

A. Furnish the following materials, which shall be delivered directly to the Owner prior to substantial completion:
   1. One (1) set of special wrenches and tools applicable to each different or special hardware component.

PART 2PRODUCTS

2.01 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements of this Section, door hardware sets indicated in Door and Frame Schedule, and the Door Hardware Schedule.

2.02 HINGES

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. McKinney Products Company : www.mckinneyhinge.com (MC).
   2. Hager Companies: www.hagerhinge.com (Referenced Mfgr. HAG).

B. Quantity: Provide the following, unless otherwise indicated:
   1. Two Hinges: For doors with heights up to 60" (11524 mm).
   2. Three Hinges: For doors with heights 60" to 90" (11524 to 2286 mm).
   3. Four Hinges: For doors with heights 90" to 120" (2286 to 3048 mm).

C. Size: Provide the following, unless otherwise indicated with hinge widths sized for door thickness and clearance required:
   1. Maximum Door Size 36" by 84" by 1-3/4"
      a. Hinge Height: 4-1/2"
      b. Standard Weight Hinge Thickness: 0.134"
      c. Heavy Weight Hinge Thickness: 0.180"
   2. Maximum Door Size 37" to 42" by 90" by1-3/4"
      a. Hinge Height: 4-1/2"
      b. Standard Weight Hinge Thickness: 0.134"
      c. Heavy Weight Hinge Thickness: 0.180"
   3. Maximum Door Size: 43" to 48" by 120" by 1-3/4"
      a. Hinge Height: 5"
      b. Standard Weight Hinge Thickness: 0.146"
      c. Heavy Weight Hinge Thickness: 0.190"

D. Hinge Height: Unless otherwise indicated, provide the following:
   1. Exterior Doors: 5" Hinges.
   2. Interior Doors: 4-1/2" Hinges.

E. Hinge Base Metal: Unless otherwise indicated, provide the following:
   1. Exterior Hinges: Stainless Steel.
   2. Interior Hinges: Stainless Steel.
   3. Hinges for Fire-Rated Assemblies: Stainless Steel.

F. Hinge Options: Comply with the following where indicated on the Door Hardware Schedule or on the Drawings:
   1. Nonremovable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the following applications:
      a. Outswinging exterior doors.
      b. Outswinging doors with locks.

2.03 EXIT DEVICES

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. Sargent Manufacturing : www.sargentlock.com (SA).
   2. Von Duprin : www.vonduprin.com (VON).
   3. Precision Hardware, Inc. : www.precisionhardware.com (PRE).

2.04 MECHANICAL LOCKS AND LATCHES

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. Schlage: www.schlage.com (Referenced Mfgr. - SC).

2. Yale-Corbin U.S.: www.yalesecurity.com
3. Best Access Systems: www.bestlock.com

B. Trim Style:
1. Series: ND series, Grade 1 rated.
2. Trim Style: Athens

C. Standards: Comply with the following:
1. Bored Locks and Latches: BHMA A156.2
2. Auxiliary Locks: BHMA A156.5
3. Push-Button Combination Locks: BHMA A156.2
4. Exit Locks: BHMA A156.5

D. Certified Products: Provide door hardware listed in the following BHMA directories:
1. Mechanical Locks and Latches: BHMA's "Directory of Certified Locks and Latches".

2.05 PUSH/PULLS

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. Rockwood Manufacturing Company: www.rockwoodmfg.com (Referenced Mfgr. - ROC)
2. Hager Companies: www.hagerhinge.com (HAG)

2.06 CLOSERS

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:

B. Surface Mounted Closers:
1. Norton Door Controls : www.nortondoorcontrols.com (NO)
2. LCN: www.lcnclosers.com (Referenced Mfgr. - LCN)

C. Standards: Comply with the following:
1. Closers: BHMA A156.4.
2. Surface Closers: BHMA Grade 1.

D. Certified Products: Provide door closers listed in the BHMA's "Directory of Certified Closers".

E. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

2.07 MANUAL AND AUTOMATIC BOLTS

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. Rockwood Manufacturing Company: www.rockwoodmfg.com (Referenced Mfgr. - ROC).
2. Glynn-Johnson: www.irco.com.

2.08 GASKETING

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. Pemko Manufacturing Co: www.pemko.com (Referenced Mfgr. - PEM).
2. National Guard Products, Inc: www.ngpinc.com.

B. Standard: Comply with BHMA A156.22.

C. General: Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled. Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.09 WALL AND FLOOR STOPS

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. Trimco Hardware : www.trimcobbw.com (TR)
2. Rockwood Manufacturing Company: www.rockwoodmfg.com (Referenced Mfgr. - ROC).

2.10 THRESHOLDS

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. Pemko Manufacturing Co: www.pemko.com (Referenced Mfgr. - PEM).
   2. National Guard Products, Inc.

2.11 PROTECTION PLATES

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. Rockwood Manufacturing Company: www.rockwoodmfg.com (Referenced Mfgr. - ROC).
   2. Hager Companies: www.hagerhinge.com.

B. Sizes:
   1. Kick Plates:
      a. Width: 2" Less than door width.
      b. Height: 10"
   2. Mop Plates:
      a. Width: 2" Less than door width.
      b. Height: 4"
   3. Armor Plates:
      a. Width: 2" Less than door width.
      b. Height: 34"
   4. Stretcher Plates:
      a. Width: 2" Less than door width.
      b. Height: 6"
   5. Johnson Hardware: www.johnsonhardware.com.

2.12 GENERAL REQUIREMENTS FOR DOOR HARDWARE PRODUCTS

A. Provide products that comply with the following:
   1. Applicable provisions of Federal, State, and local codes.
   2. ANSI/ICC A117.1, American National Standard for Accessible and Usable Buildings and Facilities.
   3. Applicable provisions of NFPA 101, Life Safety Code.
   4. Fire-Rated Doors: NFPA 80.
   5. All Hardware on Fire-Rated Doors: Listed and classified by UL as suitable for the purpose specified and indicated.

2.13 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
   1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for unit already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut opposite face is exposed unless it is the only means of securely attaching the door hardware. Where bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
   2. Steel Machine or Wood Screws: For the following fire-rated applications:
      a. Strike plates to frames.
      b. Closers to doors and frames.
   3. Steel Through Bolts: For the following fire-rated applications, unless door blocking is provided:
      a. Surface hinges to doors.
      b. Closers to doors and frames.

4. Spacers or Sex Bolts: For through bolting of hollow metal doors.
5. Fasteners for Wood Doors: Comply with requirements of DHI WDHS.2, "Recommended Fasteners for Wood Doors".

2.14 FINISHES

A. Finish in general - US32D Satin Stainless Steel.

B. Locksets - US32D Stain Stainless Steel.

C. Push Plates and Door Pulls - US32D Satin Stainless Steel.

D. Weatherstrip - Clear Anodized Aluminum.

E. Door Closers - Powder Coated Aluminum.

F. Kick and Mop Plates - US32D Satin Stainless Steel.

2.15 KEYING

A. All locksets and cylinders for this project shall be keyed per the Owner's instruction.

B. Provide construction cylinders and keys during the construction period.

C. The Door Hardware Supplier shall meet with the Owner to prepare the permanent keying schedule.

D. The permanent cylinders, change keys and control keys, prepared according to the approved keying schedule, shall be transmitted directly to the Owner, prior to substantial completion. The Contractor shall remove construction cylinders and install the permanent cylinders. All construction cylinders shall be returned to the Door Hardware Supplier.

E. All permanent cylinders and keys shall be sent via Registered Mail, Return Receipt Requested, to the Owner.

F. Stamp all keys "Do Not Duplicate" and with change designation as directed.

G. Furnish:
1. Three (3) Building Grand Master Keys.
2. Three (3) Master Keys per set.
3. Two (2) Change Keys per lock or cylinder.
4. Two (2) Construction Keys.

PART 3EXECUTION

3.01 EXAMINATION

A. Verify that doors and frames are ready to receive work and dimensions are as indicated on shop drawings.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Use templates provided by hardware item manufacturer.

C. Install hardware on fire-rated doors and frames in accordance with code and NFPA 80.

D. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

3.03 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace at no charge to the owner, units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.
2. Door Closers: Adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches (75mm) from the latch, measured to the leading edge of the door.

B. Whenever hardware installation is made more than one month prior to acceptance or occupancy, make a final check and adjust all hardware items during the week prior to occupancy. Clean and lubricate operating items as necessary to restore proper function and finish.

C. Instruct the owner's personnel in the proper adjustment and maintenance of hardware and hardware finishes.

3.04 CLEANING AND PROTECTION OF FINISHED WORK

A. Clean adjacent surfaces soiled by door hardware installation.

B. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.05 SCHEDULE

A. Hardware Groups: see drawings.

END OF SECTION

SECTION 09111
NON-LOADBEARING METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal partition, ceiling, and soffit framing.

B. Framing accessories.

1.02 RELATED REQUIREMENTS

A. Section 06100 - Rough Carpentry: Wall sheathing.

B. Section 07212 - Board and Batt Insulation: Insulation.

1.03 REFERENCE STANDARDS

A. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2011a.

B. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2011.

1.04 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section with minimum 3 years experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

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:

B. Metal Framing Connectors and Accessories:
   1. Same manufacturer as framing.

2.02 FRAMING MATERIALS

A. Fire Rated Assemblies: Comply with applicable code and as indicated on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that rough-in utilities are in proper location.

3.02 INSTALLATION OF STUD FRAMING

A. Comply with requirements of ASTM C754.

B. Extend partition framing to structure where indicated and to ceiling in other locations.

C. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.

D. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.

E. Align and secure top and bottom runners at 24 inches on center.

F. Stud splicing is not permissible.

G. Fabricate corners using a minimum of three studs.

H. Double stud at wall openings, door and window jambs, not more than 2 inches from each side of openings.

I. Brace stud framing system rigid.

J. Coordinate erection of studs with requirements of door frames and window frames; install supports and attachments.

K. Coordinate installation of bucks, anchors, and blocking with electrical, mechanical, and other work to be placed within or behind stud framing.

L. Blocking: Use steel channels secured to studs. Provide blocking for support of plumbing fixtures, toilet partitions, wall cabinets, toilet accessories, hardware, opening frames, and as needed.

END OF SECTION

SECTION 09290
GYPSUM BOARD

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Gypsum wallboard for fire rated assemblies as indicated in the design drawings.

1.02 REFERENCE STANDARDS

A. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2012.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2012.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store products under cover and elevated above grade.

C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

PART 2 PRODUCTS

2.01 FIREPROOFING APPLICATIONS

A. Provide completed fire resistance rated assemblies identical in materials and construction to those tested for fire resistance.

B. Type "X" rated 5/8-inch gypsum board will be applied per drawings in order to provide fire rated barriers.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Do not install until members and construction to be protected have been completed, ancillary work that needs to be covered by fireproofing has been completed, and the need for subsequent cutting and patching of fireproofing has been eliminated.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 BOARD FIREPROOFING INSTALLATION

A. Minimize the amount of time that structural members are exposed without fireproofing.

B. Install in strict accordance with manufacturer's instructions, conditions of testing, and as indicated on the drawings.

C. Ensure that no gaps or cracks in fireproofing exist that would impair fire resistance of separation.

D. Finish exposed board with joint tape and joint compound covering fastener heads and accessories; finish gypsum drywall to level 4 standard (GA-214-07); touch-up and sand to produce a smooth surface ready for finish application.

3.04 INSPECTION AND LABELING

A. Do not enclose or cover fireproofing work until it has been inspected by authorities having jurisdiction.

B. After completion of installation label major fireproofing surfaces with permanent, red marking in the words "Fire Resistant Barrier - Do Not Remove" or equivalent as approved by authorities having jurisdiction.

END OF SECTION

SECTION 09960
HIGH-PERFORMANCE COATINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. High performance coatings.

B. Special preparation of surfaces.

1.02 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2013a.

B. SSPC-SP 2 - Hand Tool Cleaning; Society for Protective Coatings; 1982 (Ed. 2004).

C. SSPC-SP 3 - Power Tool Cleaning; Society for Protective Coatings; 1982 (Ed. 2004).

D. SSPC-SP 7 - Brush-Off Blast Cleaning; Society for Protective Coatings; 2007.

1.03 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating coating materials .

C. Samples: Submit two samples 6x6 inch in size illustrating colors for selection.

D. Manufacturer's Installation Instructions: Indicate special procedures.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Maintenance Data: Include cleaning procedures and repair and patching techniques.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Extra Coating Materials: 3 gallon of each type and color.
   2. Label each container with manufacturer's name, product number, color number, and room names and numbers where used.

1.04 QUALITY ASSURANCE

A. Maintain one copy of each referenced document that applies to application on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

C. Applicator Qualifications: Company specializing in performing the work of this section with minimum 3 years documented experience.

1.05 MOCK-UP

A. Provide mock-up ,.5 feet long by.5 feet wide, illustrating coating, for each specified coating.

1.06 FIELD CONDITIONS

A. Do not install materials when temperature is outside manufacturer's recommended range.

B. Maintain this temperature range, 24 hours before, during, and 72 hours after installation of coating.

C. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

D. Restrict traffic from area where coating is being applied or is curing.

1.07 WARRANTY

A. See Section 01780 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a three year period after Date of Substantial Completion.

C. Warranty: Include coverage for bond to substrate.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. High-Performance Coatings:
   1. Sherwin-Williams Company; _____: www.protective.sherwin-williams.com/industries.
   2. Substitutions: Section 01600 - Product Requirements.

2.02 HIGH-PERFORMANCE COATINGS

A. Provide coating systems that meet the following minimum performance criteria, unless more stringent criteria are specified:
   1. Abrasion Resistance: 100 mgs lost, when tested in accordance with ASTM D 4060.
   2. Hardness: Shore D, when tested in accordance with ASTM D 2240.
   3. Adhesion: 300psi, when tested in accordance with ACI 503R.

2.03 MATERIALS

A. Coatings - General: Provide complete multi-coat systems formulated and recommended by manufacturer for the applications indicated, in the thicknesses indicated; number of coats specified does not include primer or filler coat.
   1. Lead content: Not greater than 0.06 percent by weight of total nonvolatile content.
   2. Chromium content, as hexavalent chromium, zinc chromate, or strontium chromate: None.
   3. Maximum volatile organic compound (VOC) content: As required by applicable regulations.
   4. Colors: As indicated.

B. Epoxy Coating: Two coats, water-based epoxy, gloss finish.
   1. Product characteristics:
      a. Dry film thickness, per coat: 25-30 mils, minimum.
   2. Product: Saniflex Interior Wall System manufactured by Sherwin-Williams.

C. Epoxy Floor Coating: Two coats, two-part, polyamide epoxy, non-skid finish.
   1. Product characteristics:
      a. Dry film thickness, per coat: 30-35 mils, minimum.
   2. Product: EPO-Flex MER I manufactured by Sherwin-Williams.

D. Primers: As recommended by coating manufacturer for specific substrate, unless otherwise specified.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that substrate surfaces are ready to receive work as instructed by the coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates.

C. Cementitious Substrates: Do not begin application until substrate has cured 28 days minimum and measured moisture content is not greater than 16 percent.

D. Wood: Do not begin application if substrate has moisture content over 19 percent.

3.02 PREPARATION

A. Clean surfaces of loose foreign matter.

B. Remove substances that would bleed through finished coatings. If unremovable, seal surface with shellac.

C. Remove finish hardware, fixture covers, and accessories and store.

D. Protect adjacent surfaces and materials not receiving coating from spatter and overspray; mask if necessary to provide adequate protection. Repair damage.

3.03 PRIMING

A. Apply primer to all surfaces, unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.

B. Wood: Prior to priming patch with filler to produce smooth, even surface.

C. Concrete: Prior to priming, patch with masonry filler to produce smooth surface.

D. Wood Items to Receive Transparent Finish: Wipe off dust and grit, sealing, seal knots, pitch streaks, and sappy sections as directed by coating manufacturer. Fill nail holes and cracks with matching tinted filler.

3.04 COATING APPLICATION

A. Apply coatings in accordance with manufacturer's instructions.

B. Apply in uniform thickness coats, without runs, drips, pinholes, brush marks, or variations in color, texture, or finish. Finish edges, crevices, corners, and other changes in dimension with full coating thickness.

3.05 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

B. Clean surfaces immediately of overspray, splatter, and excess material.

C. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

3.06 PROTECTION

A. Protect finished work from damage.

3.07 SCHEDULE

A. Colors: As indicated on Finish Schedule.

END OF SECTION

SECTION 10523
FIRE EXTINGUISHERS

PART 1GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

1.02 RELATED SECTIONS

A. Section 06100 - Rough Carpentry.

1.03 REFERENCES

A. NFPA 10 - Standard for Portable Fire Extinguishers; National Fire Protection Association; 2007.

B. UL (FPED) - Fire Protection Equipment Directory; Underwriters Laboratories Inc.; current edition.

1.04 QUALITY ASSURANCE

A. Obtain from one source from a single manufacturer.

B. Provide extinguishers classified and labeled by Underwriters Laboratories Inc. for the purpose specified and indicated.

1.05 SUBMITTALS

A. Shop Drawings: Indicate wall bracket mounted measurements.

B. Product Data: Provide extinguisher operational features, color and finish, and anchorage details.

C. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

D. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

PART 2PRODUCTS

2.01 MANUFACTURERS

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. JL Industries, Inc: www.jlindustries.com.
   2. Amerex Corporation: www.amerex-fire.com.
   3. Larsen's Manufacturing Co: www.larsensmfg.com.

2.02 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
   1. Provide extinguishers labeled by Underwriters Laboratories Inc. for the purpose specified and indicated.

B. Dry Chemical Type Fire Extinguishers: Steel tank, with pressure gage.
   1. UL-rated 4A : 60 BC
   2. Capacity: 10 pound capacity.
   3. Finish: Baked enamel, manufacturers standard color.

2.03 ACCESSORIES

A. Extinguisher Brackets: Wall brackets, formed steel, chrome-plated.

PART 3EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that blocking, backing and surfaces to receive specialties are properly prepared, sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.
   1. Fasten mounting brackets to structure, square and plumb.

B. Fire extinguishers: Mount to wall with standard wall brackets.

3.03 ADJUSTMENTS

A. Adjust moving parts to operate satisfactorily at time of project substantial completion and during warranty period.

3.04 SCHEDULES

A. Locations shown on drawings.

END OF SECTION

SECTION 10800

TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1GENERAL

1.01 SECTION INCLUDES

A. Accessories for toilet rooms, showers, and utility rooms.

B. Grab bars.

C. Coat Hooks

1.02 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2002.

B. ASTM A269 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2007a.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2007.

D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2003.

E. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium; 2003.

F. ASTM C1036 - Standard Specification for Flat Glass; 2006.

G. GSA CID A-A-3002 - Mirrors, Glass; U.S. General Services Administration; 1996.

1.03 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on accessories describing size, finish, details of function, attachment methods.

C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

1.04 COORDINATION

A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

B. Verify proper blocking and coordinate with other trades prior to instalation.

PART 2PRODUCTS

2.01 MANUFACTURERS

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:

B. Products listed are made by Bobrick.

C. Other Acceptable Manufacturers:
   1. A & J Washroom Accessories Inc: www.ajwashroom.com.
   2. American Specialties, Inc: www.americanspecialties.com.
   3. Bradley Corporation: www.bradleycorp.com.
   4. Substitutions: Section 01600 - Product Requirements.

D. All items of each type to be made by the same manufacturer.

2.02 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.

2.03 FINISHES

A. Stainless Steel: No. 4 satin brushed finish, unless otherwise noted.

2.04 TOILET ROOM ACCESSORIES

A. Toilet Paper Dispenser: Single roll, surface mounted bracket type, chrome-plated zinc alloy brackets, spindleless type for tension spring delivery designed to prevent theft of tissue roll.

B. Paper Towel Dispenser: Folded paper type, stainless steel, semi-recessed, with viewing slots on sides as refill indicator and tumbler lock.

C. Waste Receptacle: Stainless steel, freestanding style with swing top.

D. Soap Dispenser: Liquid soap dispenser, wall-mounted, surface, with stainless steel cover and horizontal stainless steel tank and working parts; push type soap valve, check valve, and window gauge refill indicator, tumbler lock.

E. Mirrors: Stainless steel framed, 6 mm thick float glass mirror.
   1. Size: 24" x 36".
   2. Frame: 0.05 inch (1.3 mm) angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; No.4 finish.
   3. Backing: Full-mirror sized, minimum 0.03 inch (0.8 mm) galvanized steel sheet and nonabsorptive filler material.

2.05 UTILITY ROOM ACCESSORIES

A. Combination Utility Shelf/Mop and Broom Holder: 0.05 inch (1.3 mm) thick stainless steel, Type 304, with 1/2 inch (12 mm) returned edges, 0.06 inch (1.6 mm) steel wall brackets.

2.06 ENTRYWAY ACCESSORIES

A. Fabricated double hook hat & coat hook

B. Verify proper backing and coordinate with other trades prior to installation

PART 3EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

3.02 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights and Locations: As required by accessibility regulations, as indicated on drawings, and as follows:

END OF SECTION

SECTION 12300
MANUFACTURED CASEWORK

PART 1GENERAL

1.01 SECTION INCLUES

A. Factory fabricated modular casework.

1.02 REFERENCE STANDARDS

A. NEMA LD-3

B. ALA - American Laminators Association low pressure thermofused polyester and melamine laminates.

1.03 SUBMITTALS

A. Shop Drawings:
   1. Complete shop drawings submitted showing all casework, elevations, plans, cross sections and installation details. Surface finishes will be noted along with information about equipment being installed into casework requiring coordination of other trades. Provide 1 set of reproducible drawings and 3 sets of blackline prints.
   2. A complete keying schedule will be submitted with proposed keying for review by owner.

B. Samples:
   1. Samples of plastic laminate showing full line of color selections available shall be provided. Also, samples of actual hardware or catalog cut sheets shall be submitted on manufacturer's standards.
   2. Sample cabinets shall be provided to show hardware, construction techniques, and workmanship.
   3. These samples may be retained for verification that project work is of the same quality.

1.04 GUARANTEE

A. Manufacturer shall provide a written guarantee that all casework materials and workmanship conforms to project specifications and industry standards. Any defective work will be repaired or replaced at no cost to the owner.

B. This guarantee shall continue in effect for a period of one year from date of substantial completion of project.

PART 2 MATERIALS

2.01 MATERIAL STANDARDS

A. No particle board shall be used in any cabinets, all plywood construction, typical all cabinets and shelving.

B. Exposed Portions:
   1. Exposed material shall be pattern and color as specified. If not specified, it shall be a non-premium priced, high pressure standard pattern laminate .028" minimum thickness meeting NEMA LD-3 standards. High pressure laminates are laminated with PVA adhesive under 50 PSI pressure.

C. Semi-Exposed Portions:
   1. Semi-exposed materials color shall be: Almond.
      a. Low pressure thermofused melamine or polyester laminate meeting ALA standards. Lamination is achieved through self-bonding of the resin under 300 PSI at 320º F.
   2. Interior faces of tops, bottoms, ends, partitions, and shelves shall be overlaid with low pressure thermofused melamine laminate.
   3. Cabinet backs and drawer bottoms shall have factory applied coating to both faces. Interior face to match cabinet interior color.

D. Concealed Portions, Cores and Substrates:
   1. Concealed materials shall be any species of sound, dry solid stock, plywood, medium density fiberboard, or a combination thereof.

2. All materials shall be securely glued with Type II adhesive meeting ASTM-D3110 standards.
3. Laminate core material shall be premium grade plywood, 45lb. Density meeting ANSI-208.1 standards in either fir or pine composition. Thicknesses used are 7/16", 11/16", ¾", 7/8" and 1".

E. Visible Edges, Exposed and Semi-Exposed:
1. Exposed edges of cabinet ends, doors and drawer fronts shall be edge banded with thick 3mm PVC.
2. Exposed edges of cabinet shelves, sub-tops, bottoms and partitions shall be edge banded with .024" PVC to match cabinet interior.
3. Edges at underside of upper cabinets and drawer parts shall be edge banded with .024" PVC to match cabinet interior.
4. Machine applied edgebanding shall be applied after face laminates are applied.

2.02 HARDWARE

A. Hinges:
1. Five knuckle, radius tips 2 3/4" x .095" fastened with 4 screws to end panel and 5 screws to door panel with door opening of 270. Satin chrome finish standard. Hinge is RPC #374.

B. Door and Drawer Pulls:
1. 5/16" bent wire design 96mm x 32mm made of solid brass. Available in Satin Chrome (US26D).

C. Drawer Slides:
1. Box drawer – single extension, almond epoxy finish with 75lb. Load rating. Features positive in and out stops, stay close detent, one side captive and four nylon rollers.
2. File drawers – full extension zinc finish with 150lb. Load rating. Features positive in and out stops, stay close detent and steel ball bearings.

D. Catches:
1. Magnetic Type – 7lb. Pull rating with metal base plate and plastic housing to match cabinet interior. Epco #1000.

2.03 CABINET COMPONENTS

A. Drawers:
1. Drawer fronts shall be 11/16" thick plywood overlaid with high pressure plastic laminate on both faces to equal 3/4" thickness. Inside color to match cabinet interiors with face color to be selected. Edges are banded with 3mm PVC.
2. Drawer sides shall be 1/2" thick plywood overlaid with thermofused melamine on two sides to match cabinet interior. Top edges are banded with .024" PVC. Drawer parts are joined together with 6mm x 25mm hardwood dowels 32mm on centers.
3. Drawer bottoms, sub-fronts and backs shall be ½" plywood with factory applied coating to both faces. Bottoms are tongued into sides, back and sub-front, glued and clamped to produce a rigid square drawer. Interior face color to match cabinet interiors.
4. Drawer fronts shall be attached to the sub-fronts with minimum of four #8 x 1" panhead screws.
5. Drawers shall be mounted with positive "IN" and "OUT" stops to provide permanent and quiet operation. Drawer fronts that impact cabinet body will not be allowed.
6. All drawers to have roller guides.

B. Doors:
1. Doors shall be 11/16" thick plywood overlaid with a high pressure plastic laminate on both faces to equal 3/4" thickness. Inside color to match cabinet interiors with face color to be selected.
2. Edges are banded with 3mm PVC.
3. Hinges are installed as follows:

Maximum Door Size	No. of Knuckles	No. of Concealed
24" x 36"	2	2

24” x 48”23
24” x 84”34
24” x 90”45

4. Stile and rail glass doors shall have a 3/4” thick door blank cut to provide 3” wide stiles and rails with tall doors to have rails at mid point. 1/4” plate glass is fitted into cut-out and stopped with removable PVC stops.

C. Cabinet Ends:
1. Semi-exposed ends shall be 3/4” plywood overlaid with thermofused melamine on both faces.
2. Exposed or finish ends shall be 11/16” thick plywood overlaid with high pressure plastic laminate on both faces to equal 3/4" thickness. Inside color to match cabinet interiors with face color to be selected.
3. Ends shall be drilled for adjustable shelf supports with 5mm diameter holes on 32mm (1 1/4”) centers.
4. Front edge shall be banded with 3mm PVC. Edge colors are chosen from a select range to either complement or match the face color.
5. Top and bottom edges of upper ends shall be banded with .024” PVC.

D. Cabinet Tops and Bottoms:
1. Semi-exposed tops and bottoms shall be 3/4” particle board overlaid with thermofused melamine on both faces. Front edge shall be banded with .024” PVC.
2. Exposed or finished tops and bottoms shall be 11/16” thick plywood overlaid with high pressure plastic laminate on both faces to equal 3/4” thickness. Inside color to match cabinet interiors with exposed color to be selected.
3. Front edging shall be banded with .024” PVC.

E. Fixed and Adjustable Shelves:
1. Standard shelf system is designed to support up to 50lbs. Per square feet uniform shelf loading while allowing no more than 2mm (.080”) per lineal-foot deflection of unsupported shelf span. Deflection is defined as the measured distance from a straight line that a shelf will deflect under load. Industry standard is L/144” (the length of the shelf divided by 144”) as the standard for maximum acceptable shelf deflection. The following materials and thickness shall be used to provide this performance.
   a. Shelves at cabinets up to 32” wide shall be ¾” thick plywood over laid with thermofused melamine on both faces.
   b. Shelves at cabinets over 32” up to 48” wide shall be 1” thick plywood overlaid with thermofused melamine on both faces. Spans over 48” long are not recommended.
2. The front edge only of adjustable shelves inside cabinets shall be banded with .024” PVC.
3. Adjustable shelves shall be supported on 4 shelf clips in cabinets up to 25” deep and 6 shelf clips in cabinets greater than 25” deep.
4. Fixed shelves shall be ¾” or 1” thick plywood overlaid with thermofused melamine on both sides. Front edge banded with .024” PVC.
5. Adjustable shelves for wall mounted standard shall be 1” thick plywood overlaid with thermofused melamine on both faces. All four edges are edgebanded with .024” PVC.

F. Cabinet Backs:
1. Semi-exposed backs shall be ½” plywood with factory applied coating to both faces. Interior face to match cabinet interior color. Semi-exposed edge shall be banded with .024” PVC.
2. Exposed or finish backs shall be 11/16” plywood overlaid with high pressure plastic laminate on both faces to equal ¾” thickness. Exterior color to be selected.
3. Removable backs are available at any location for service access as required by project.
4. Bottom edge of upper backs shall be banded with .024” PVC.

G. Partitions:
1. Vertical ½” and ¾” partitions shall be plywood overlaid with thermofused melamine on both faces. Exposed edges are banded with .024” PVC.

H. Cabinet Bases:
   1. Cabinet bases shall be 4” standard height made in continuous lengths to ensure straight, level and true line of casework. Core material is ¾” plywood unless specified otherwise. Bases are unfinished ready for scheduled finish to be applied.

I. Fillers and Soffit Panels:
   1. Panels shall be made of 11/16” plywood overlaid with high pressure plastic laminate on both faces to equal 34” thick and shall be fitted to adjacent surfaces.
   2. Exposed faces shall have laminate matching to adjacent cabinets.

J. Countertop
   1. Material: Sanalite
   2. Thickness: 1"
   3. Backsplash: 5"
   4. Edge Detail: Bullnose

PART 3EXECUTION

3.01 ATTACHMENT

A. All casework items shall be securely anchored to building structure, except for those items identified as “mobile” or “moveable” on drawings, which are to be adjusted to prevent any rocking when sitting on finish floor.

B. Primary anchorage of base and wall cabinets shall be through the ½” thick cabinet back into wall framing or blocking furnished under other sections. Additional anchorage will be made into cabinet bases and adjacent side walls where they occur. Appropriate sized anchor screws shall be used to best attach to the existing wall condition which will allow each cabinet to be loaded to a capacity of 50 lb. per square foot of shelf area.

C. All installations shall be in strict conformance with seismic codes.

D. At free-spanning countertops or work surfaces, steel support brackets shall be provided at a maximum spacing of 32", or as shown on drawings. Support brackets are to be designed to allow for knee space clearance and attach to wall framing for support.

3.02 WORKMANSHIP

A. Erect casework straight, level, plumb and true.

B. Neatly scribe casework to walls, soffits and columns. Fillers to color match adjacent surfaces and will not be permitted in excess of 1 ½” wide, unless specifically requested otherwise.

C. Joints are not permitted in countertops

3.03 COORDINATION

A. Verify requirements and location from architect before cutting holes for grommets.

B. Provide cutting and fitting as necessary to accommodate mechanical and electrical work built into casework units.

C. Provide alterations to casework to keep devices accessible when they are covered by casework. This includes mechanical and electrical switches, receptacles, panels, access doors and other devices.

3.04 ADJUSTING AND CLEANING

A. Adjust doors, hardware fittings, and other moving or operating parts to function smoothly and correctly.

B. Broom clean all work installed in this section inside and exposed outer surfaces. Remove from site, all trash, packing material, material scraps and other debris related to the work of this section.

C. Touch up abraded factory-finished surfaces to match original finish.

END OF SECTION

SECTION 13000

SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS

PART 1 - GENERAL

1.01 DESCRIPTION:

A. Provide seismic restraint in accordance with the requirements of this section in order to maintain the integrity of nonstructural components of the building so that they remain safe and functional in case of seismic event.

B. Definitions: Non-structural building components are components or systems that are not part of the building's structural system whether inside or outside, above or below grade. Non-structural components of buildings include:
   1. Architectural Elements: Facades that are not part of the structural system and its shear resistant elements; cornices and other architectural projections and parapets that do not function structurally; glazing; nonbearing partitions; suspended ceilings; stairs isolated from the basic structure; cabinets; bookshelves; medical equipment; and storage racks.
   2. Electrical Elements: Power and lighting systems; substations; switchgear and switchboards; auxiliary engine-generator sets; transfer switches; motor control centers; motor generators; selector and controller panels; fire protection and alarm systems; special life support systems; and telephone and communication systems.
   3. Mechanical Elements: Heating, ventilating, and air-conditioning systems; medical gas systems; plumbing systems; sprinkler systems; pneumatic systems; boiler equipment and components.
   4. Transportation Elements: Mechanical, electrical and structural elements for transport systems, i.e., elevators and dumbwaiters, including hoisting equipment and counterweights.

1.02 RELATED REQUIREMENTS:

A. Section

B. Section

1.03 QUALITY CONTROL:

A. Shop-Drawing Preparation:
   1. Have seismic-force-restraint shop drawings and calculations prepared by a professional structural engineer experienced in the area of seismic force restraints. The professional structural engineer shall be registered in the state where the project is located.
   2. Submit design tables and information used for the design-force levels, stamped and signed by a professional structural engineer registered in the State where project is located.

B. Coordination:
   1. 1. Do not install seismic restraints until seismic restraint submittals are approved by the Resident Engineer.
   2. 2. Coordinate and install trapezes or other multi-pipe hanger systems prior to pipe installation.

C. Seismic Certification:

   In structures assigned to IBC Seismic Design Category C, D, E, or F, permanent equipment and components are to have Special Seismic Certification in accordance with requirements of section 13.2.2 of ASCE 7 except for equipment that are considered rugged as listed in section 2.2 OSHPD code application notice CAN No. 2-1708A.5, and shall comply with section 13.2.6 of ASCE 7.

1.04 SUBMITTALS:

A. Submit a coordinated set of equipment anchorage drawings prior to installation including:
   1. Description, layout, and location of items to be anchored or braced with anchorage or brace points noted and dimensioned.

2. Details of anchorage or bracing at large scale with all members, parts brackets shown, together with all connections, bolts, welds etc. clearly identified and specified.
3. Numerical value of design seismic brace loads.
4. For expansion bolts, include design load and capacity if different from those specified.

B. Submit prior to installation, a coordinated set of bracing drawings for seismic protection of piping, with data identifying the various support- to-structure connections and seismic bracing structural connections, include:
1. Single-line piping diagrams on a floor-by-floor basis. Show all suspended piping for a given floor on the same plain.
2. Type of pipe (Copper, steel, cast iron, insulated, non-insulated, etc.).
3. Pipe contents.
4. Structural framing.
5. Location of all gravity load pipe supports and spacing requirements.
6. Numerical value of gravity load reactions.
7. Location of all seismic bracing.
8. Numerical value of applied seismic brace loads.
9. Type of connection (Vertical support, vertical support with seismic brace etc.).
10. Seismic brace reaction type (tension or compression): Details illustrating all support and bracing components, methods of connections, and specific anchors to be used.

C. Submit prior to installation, bracing drawings for seismic protection of suspended ductwork and suspended electrical and communication cables, include:
1. Details illustrating all support and bracing components, methods of connection, and specific anchors to be used.
2. Numerical value of applied gravity and seismic loads and seismic loads acting on support and bracing components.
3. Maximum spacing of hangers and bracing.
4. Seal of registered structural engineer responsible for design.

D. Submit design calculations prepared and sealed by the registered structural engineer specified above in paragraph 1.3A.

E. Submit for concrete anchors, the appropriate ICBC evaluation reports, OSHPD pre-approvals, or lab test reports verifying compliance with OSHPD Interpretation of Regulations 28-6.

1.05 APPLICABLE PUBLICATIONS:

A. The Publications listed below (including amendments, addenda revisions, supplements and errata) form a part of this specification to the extent referenced. The publications are referenced in text by basic designation only.
1. American Concrete Institute (ACI): 355.2-07 Qualification for Post-Installed Mechanical Anchors in Concrete and Commentary
2. American Institute of Steel Construction (AISC): Load and Resistance Factor Design, Volume 1, Third Edition
3. American Society for Testing and Materials (ASTM):
4. American Society of Civil Engineers (ASCE 7) Latest Edition.
5. International Building Code (IBC) Latest Edition
6. National Uniform Seismic Installation Guidelines (NUSIG)

1.06 REGULATORY REQUIREMENT:

A. IBC 2012.

B. Exceptions: The seismic restraint of the following items may be omitted:
1. Equipment weighing less than 400 pounds, which is supported directly on the floor or roof.
2. Equipment weighing less than 20 pounds, which is suspended from the roof or floor or hung from a wall.
3. Gas and medical piping less than 2 ½ inches inside diameter.
4. Piping in boiler plants and equipment rooms less than 1 ¼ inches inside diameter.

5. All other piping less than 2 ½ inches inside diameter, except for automatic fire suppression systems.
6. All piping suspended by individual hangers, 12 inches or less in length from the top of pipe to the bottom of the support for the hanger.
7. All electrical conduits, less than 2 ½ inches inside diameter.
8. All rectangular air handling ducts less than six square feet in cross sectional area.
9. All round air handling ducts less than 28 inches in diameter.
10. All ducts suspended by hangers 12 inches or less in length from the top of the duct to the bottom of support for the hanger.

PART 2 - PRODUCTS

2.01 STEEL:SEE STEEL FABRICATION OF THIS SPEC.

2.02 CAST-IN-PLACE CONCRETE:

PART 3 - EXECUTION

3.01 CONSTRUCTION, GENERAL:

A. Provide equipment supports and anchoring devices to withstand the seismic design forces, so that when seismic design forces are applied, the equipment cannot displace, overturn, or become inoperable.

B. Provide anchorages in conformance with recommendations of the equipment manufacturer and as shown on approved shop drawings and calculations.

C. Construct seismic restraints and anchorage to allow for thermal expansion.

D. Testing Before Final Inspection:
   1. Test 10-percent of anchors in concrete per ACI 355.2 to determine that they meet the required load capacity. If any anchor fails to meet the required load, test the next 20 consecutive anchors, which are required to have zero failure, before resuming the 10-percent testing frequency.
   2. Before scheduling Final Inspection, submit a report on this testing indicating the number and location of testing, and what anchor-loads were obtained.

3.02 EQUIPMENT RESTRAINT AND BRACING:

A. A. See drawings for equipment to be restrained or braced.

3.03 MECHANICAL DUCTWORK AND PIPING; BOILER PLANT STACKS AND BREACHING; ELECTRICAL BUSWAYS, CONDUITS, AND CABLE TRAYS; AND TELECOMMUNICATION WIRES AND CABLE TRAYS

A. Support and brace mechanical ductwork and piping; electrical busways, conduits and cable trays; and telecommunication wires and cable trays including boiler plant stacks and breeching to resist directional forces (lateral, longitudinal and vertical).

B. Brace duct and breeching branches with a minimum of 1 brace per branch.

C. Provide supports and anchoring so that, upon application of seismic forces, piping remains fully connected as operable systems which wil lnot displace sufficiently to damage adjacent or connecting equipment, or building members.

D. Seismic Restraint of Piping:
   1. Design criteria:
      a. Piping resiliently supported: Restrain to support 120-percent of the weight of the systems and components and contents.
      b. Piping not resiliently supported: Restrain to support 60-percent of the weight of the system components and contents.
   2. Provide seismic restraints according to one of the following options:
      a. Piping Connections: Provide flexible connections where pipes connect to equipment. Make the connections capable of accommodating relative differential movements between the pipe and equipment under conditions of earthquake shaking.

3.04 PARTITIONS

A. In buildings with flexible structural frames, anchor partitions to only structural element, such as a floor slab, and separate such partition by a physical gap from all other structural elements.

3.05 CEILINGS AND LIGHTING FIXTURES

A. At regular intervals, laterally brace suspended ceilings against lateral and vertical movements, and provide with a physical separation at the walls.

B. Independently support and laterally brace all lighting fixtures. Refer to applicable portion of lighting specification, Division 16 - Electrical.

3.06 FACADES AND GLAZING

A. Install attachments to structure for all façade materials as shown on construction drawings to ensure strength against applicable seismic forces at the project location.

3.07 STORAGE RACKS, CABINETS, AND BOOKCASES

A. Install storage racks to withstand earthquake forces and anchored to the floor or laterally braced from the top to the structural elements.

B. Anchor filing cabinets that are more than 2 drawers high to the floor or walls, and equip all drawers with properly engaged, lockable latches.

C. Anchor bookcases that are more than 30 inches high to the floor or walls, and equip any doors with properly engaged, lockable latches.

END OF SECTION

SECTION 13121
PRE-ENGINEERED BUILDINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufacturer-engineered, shop-fabricated structural steel building frame.

B. Insulated Metal wall and roof panels including soffits.

1.02 RELATED REQUIREMENTS

A. Section 05500 - Metal Fabrications.

B. Section 07900 - Joint Sealers.

C. Section 08300 - Specialty Doors and Frames

D. Section 08360 - Overhead Doors.

E. Section 08561 - Vinyl Plastic Window.

F. Section 08800 - Glazing.

1.03 REFERENCE STANDARDS

A. AISC 360 - Specification for Structural Steel Buildings; American Institute of Steel Construction, Inc.; 2010.

B. ASTM A36 - Standard Specification for Carbon Structural Steel; 2008.

C. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

D. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2012.

E. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2010.

F. ASTM A490 - Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength; 2012.

G. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2010a.

H. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2007.

I. ASTM A529/A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality; 2005 (Reapproved 2009).

J. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel; 2012.

K. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2010.

L. ASTM C991 - Standard Specification for Flexible Glass Fiber Insulation for Metal Buildings; 2008e1.

M. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2013.

N. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2013a.

O. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society; 2012.

P. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2010.

Q. MBMA (LR) - Low Rise Building Systems Manual; Metal Building Manufacturers Association; 2006.

R. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 2002 (Ed. 2004).

S. UL 580 - Standard for Tests for Uplift Resistance of Roof Assemblies; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.04 DESIGN REQUIREMENTS

A. Thermal Performance
   1. When tested in accordance with ASTM C518, "measurement of steady state thermal transmission", the panels shall provide a K-factor of .14 btu/sf/hr./deg. F at a 75°F mean temperature.

B. Design members to withstand dead load, applicable snow load, and design loads due to pressure and suction of wind calculated in accordance with applicable code and Structural Design Criteria.

C. Design members to withstand Design Criteria Loads.

D. Design Criteria:
   1. Wind: The roof system shall conform to IBC 2009 requirements for 150 mph 3 sec wind load, Category "D' Exposure.
   2. Seismic: Conforming to IBC 2009 where Ss = 1.50, S1 = 0.58 and 20% of Snow load for Seismic.
   3. Building to support a Monorail Crane with a 2 ton capacity and 400 pound trolley.

E. Design members to withstand UL 580 Uplift Class 60.

F. Exterior wall and roof system shall withstand imposed loads with maximum allowable deflection of 1/240 of span.

G. Provide drainage to exterior for water entering or condensation occurring within wall or roof system.

H. Permit movement of components without buckling, failure of joint seals, undue stress on fasteners or other detrimental effects, when subject to temperature range of 80 degrees F.

I. Size and fabricate wall and roof systems free of distortion or defects detrimental to appearance or performance.

1.05 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on profiles, component dimensions, fasteners.

C. Product Data: Submit manufacturer's product information, specifications and installation instructions for building components and accessories.

D. Shop Drawings: Indicate assembly dimensions, locations of structural members, connections; wall and roof system dimensions, panel layout, general construction details, anchorages and method of anchorage, installation ; framing anchor bolt settings, sizes, and locations from datum, 0,0; indicate welded connections with AWS A2.4 welding symbols; indicate net weld lengths; provide professional seal and signature.

E. Shop Drawings and Calculations: Indicate type of structural building frame required and their locations within the structure; detail of anchor bolt settings; sidewall, endwall and roof framing; diagonal bracing and location within structure; details of curbs, roof jacks and items penetrating roof; canopy framing and details; trim, wall and roof coverings and all accessory items; construction and installation details and other pertinent information required for proper and complete fabrication, assembly and erection of watertight metal building system.

F. Samples: Submit two samples of precoated metal panels for each color selected, 12x12 in size illustrating color and texture of finish.

G. Manufacturer's Instructions: Indicate preparation requirements, anchor bolt placement, and sizes.

H. Erection Drawings: Indicate members by label, assembly sequence, and temporary erection bracing.

I. Project Record Documents: Record actual locations of concealed components and utilities.

1.06 QUALITY ASSURANCE

A. Design structural components, develop shop drawings, and perform shop and site work under direct supervision of a Professional Structural Engineer experienced in design of this Work.
   1. Design Engineer Qualifications: Licensed in the State of Alaska.
   2. Conform to applicable code for submission of design calculations as required for acquiring permits.
   3. Cooperate with regulatory agency or authority and provide data as requested.

B. Perform work in accordance with AISC 360 - Specification for Structural Steel Buildings.
   1. Maintain one copy on site.

C. Perform welding in accordance with AWS D1.1.

D. Manufacturer Qualifications: Company specializing in the manufacture of products similar to those required for this project.
   1. Not less than 10 years of documented experience

E. Erector Qualifications: Company specializing in performing the work of this section with minimum 5 years experience.

1.07 PRODUCT HANDLING, DELIVERY AND STORAGE

A. Deliver and store prefabricated components, sheets, panels and other manufactured items so they will not be damaged or deformed.

B. Stack materials on platforms or pallets above grade or on concrete slab, covered with opaque tarpaulins or other approved weather-resistant ventilated covering.

C. Store metal sheets and panels if subjected to water accumulation in such a manner so they will drain freely. Do not store sheets and panels in contact with other materials which might cause staining.

D. Inspect panels for quality. Damaged material must be reported to determine if replacement is required.

E. Prevent moisture between panels and secure as required.

1.08 WARRANTY

A. See Section 01780 - Closeout Submittals, for additional warranty requirements.

B. Provide Manufacturer's standard one (1) year material and workmanship warranty for all components

C. Correct defective Work within a one year period after Date of Substantial Completion.
   1. Include coverage for exterior pre-finished surfaces to cover pre-finished color coat against chipping, cracking or crazing, blistering, peeling, chalking, or fading. Include coverage for weather tightness of building enclosure elements after installation.

D. Provide two year manufacturer warranty for .

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Pre-Engineered Buildings: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include, but are not limited to the following:
   1. Butler Manufacturing Company: www.butlermfg.com/speclink.
   2. Ceco Building Systems: www.cecobuildings.com.
   3. Chief Buildings: www.chiefbuildings.com.
   4. Kirby Building Systems: www.kirbybuildingsystems.com.

5. Metallic Building Company: www.metallic.com.
6. Nucor Building Systems: www.nucorbuildingsystems.com
7. VP Buildings: www.vp.com.
8. Substitutions: See Section 01600 - Product Requirements.

2.02 METAL BUILDING

A. Single span rigid frame.

B. Bay Spacing: 25 feet.

C. Primary Framing: Rigid frame of rafter beams and columns, canopy beams, and wind bracing.

D. Secondary Framing: Purlins, and other items detailed.

E. Insulated Wall System: Preformed metal panels of vertical profile, with sub-girt framing/anchorage assembly, and accessory components.

F. Insulated Roof System: Preformed metal panels oriented parallel to slope, with sub-girt framing/anchorage assembly, insulation, and liner panels, and accessory components.

G. Roof Slope: 2 inches in 12 inches.

2.03 MATERIALS - FRAMING

A. Any members or steel to be exposed after completion to be hot dipped galvanize or equivalent. both interior and exterior

B. Structural Plate or Bar Stock: Minimum yield strength of 50,000 psi.

C. Cold Formed Structural Steel: Minimum yield strength of 55,000 psi.

D. Structural Tubing: ASTM A 500, Grade B cold-formed.

E. Plate or Bar Stock: ASTM A 529/A 529M, Grade 50.

F. Anchor Bolts: ASTM A307, galvanized to ASTM A153/A153M.

G. Bolts, Nuts, and Washers: ASTM A325 (ASTM A325M), Type 1, galvanized to ASTM A153/A153M, Class C.

H. Welding Materials: Type required for materials being welded.

I. Shop Coat paint shall meet the performance characteristics of Steel Structural Painting Council Specification SSPC-SP15.

J. Grout: ASTM C1107/C1107M, Non-shrink type, premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents, capable of developing minimum compressive strength of 2400 psi in two days and 7000 psi in 28 days.

K. Any memebers or steel to be exposed after completion to be hot dipped galvanize or equivalent, for both interior and exterior.

2.04 MATERIALS - WALLS AND ROOF

A. The exterior face gauge shall be 22 Ga. thick , G-90 galvanized steel conforming to ASTM A-653 and/or prefinished AZ-50 aluminum-zinc coated steel conforming to ASTM A-792, minimum grade 33 with stucco embossed texture.

B. The interior liner shall be 24 Ga. thick, G-90 galvanized steel conforming to ASTM A-653 and/or AZ-50 aluminum-zinc coated steel conforming to ASTM A-792, minimum grade 33 with stucco embossed texture

C. Foam core shall be continuously foamed-in-place, zero ODP and zero VOC closed cell polyurethane.

D. Steel Sheet: ASTM A792/A792M aluminum-zinc alloy coated to AZ50/AZM150.

E. Vapor Barrier:
   1. Air Infiltration: Air infiltration shall not exceed .06 cfm per square foot of wall area when tested in accordance with ASTM E283 at a static pressure of 12 psf (.576 kPa)

2. Static Water Penetration: There shall be no uncontrolled water penetration through the panel joints at a static pressure of 20 psf (.96 kPa) when tested in accordance with ASTM E331.
3. Dynamic Water Penetration: There shall be no uncontrolled water penetration through the panel joints when subjected to a 95 mph (153 kph) slip stream air flow and application of water for a 15 minute period in accordance with AAMA501.1
4. Condensation Resistance Factor: The minimum condensation resistance factor of the panel shall be 92 when tested in general accordance with AAMA 1503.1

F. Bond Strength:
1. Fatigue Test: The panel shall withstand deflection cycling at L/180 to two million alternate cycles with no evidence of delamination, core cracking or permanent bowing.
2. Freeze/Heat Cycling: The panel shall exhibit no delamination, surface blistering or permanent bowing when subjected to cyclic temperature extremes of -20°F (-28°C) to +180°F (+82°C) for twenty-one (21) eight hour cycles.
3. Humidity Test: The panel shall exhibit no delamination or metal corrosion at interface when subjected to a 140°F (60°C) temperature and 100% relative humidity for a total of 1200 hours.
4. 4.Autoclave Test: The panel shall exhibit no delamination of the foam core from metal skins when exposed to 2 psi (.122 kg/sq. cm) pressure at a temperature of 212°F (100°C) for a total of 2 ½ hours.

G. Joint Seal Gaskets: Manufacturer's standard type.

H. Fasteners: Manufacturer's standard type, galvanized to comply with requirements of ASTM A153/A153M, finish to match adjacent surfaces when exterior exposed.

I. Bituminous Paint: Asphaltic type.

J. Sealant: Manufacturer's standard type.

K. Metal Mesh: Galvanized steel wire, woven.

L. Trim, Closure Pieces, Caps, Flashings, Rain Water Diverter: Same material, thickness and finish as exterior sheets; brake formed to required profiles.

2.05 FABRICATION - FRAMING

A. Fabricate members in accordance with AISC Specification for plate, bar, tube, or rolled structural shapes.

B. Primary Framing: Rigid frames of shop-welded steel plate columns and rafters, both tapered and uniform depth sections as required by drawing, complete with all necessary stiffeners, connection plates and holes for field-bolted assembly.
1. All primary rigid framed field-bolted connections with A325 high-strength bolts and nuts of size required by building system manufacturer.

C. Endwall Framing: Precision cold-formed and/or shop welded steel plate members consisting of rafters and columns fabricated for field-bolted assembly.

D. Anchor Bolts: Formed with bent shank, assembled with template for casting into concrete.

E. Clean components of oil, dirt, loose scale and foreign matter and apply one (1) coat of manufacturer's standard shop coat.

2.06 FINISHES

A. Framing Members: Clean, prepare, and shop prime. Do not prime surfaces to be field welded.

B. Exterior face sheet shall be treated with a nominal 0.2 mil (5 microns) base primer, followed by a nominal 0.7 mil (17.5 microns) finish coat of full strength 70% PVDF Fluoropolymer coating in manufacturer’s standard colors.

C. The interior sheet shall be a nominal 0.2 mil (5 microns) primer followed by a nominal 0.7 (17.5 microns) polyester coating in manufacturer’s standard colors.

D. Exterior Surfaces of Wall and Roof Panels and Accessories: Color as selected from manufacturer's standard range.

E. Interior Surfaces of Wall Components and Accessories: Precoated enamel on steel of modified silicone finish, color as selected from manufacturer's standard range.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that foundation, floor slab, mechanical and electrical utilities, and placed anchors are in correct position

3.02 ERECTION - FRAMING

A. Erect framing in accordance with AISC 360 - Specification for Structural Steel Buildings.

B. Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation of permanent bracing. Locate braced bays as indicated.

C. Set column base plates with non-shrink grout to achieve full plate bearing.

D. Do not field cut or alter structural members without approval.

E. Install all permanent diagonal rod or angle bracing in roof and sidewalls as approved by manufacturer.

F. After erection restore to original coating or equivalent.

3.03 ERECTION - WALL AND ROOF PANELS

A. Install in accordance with manufacturer's instructions.

B. Exercise care when cutting prefinished material to ensure cuttings do not remain on finish surface.

C. Install roof and canopy panels in such a manner to permit drainage to eaves of building, with panel ends square to eave.

D. Fasten cladding system to structural supports, aligned level and plumb.

E. Locate end laps over supports. End laps minimum 2 inches. Place side laps over bearing.

F. Located end laps over supports. End laps as directed by manufacturer. Install panel sidelap away from prevailing wind or view direction when possible, maintaining proper lap without fastener dimpling or excessive overlap.

G. Provide expansion joints where indicated.

H. Install weather seal under ridge cap. Flash and seal roof panels at eave, gable and perimeter of all openings through roof and elsewhere as required or shown on drawings.

I. Flash and/or seal wall and liner panels at perimeter of all openings, under eaves and gable trims, along lower panel edges, and elsewhere as required or shown on drawings, as applicable.

J. Use concealed fasteners.

K. Install sealant and gaskets to prevent weather penetration.

3.04 INSTALLATION - ACCESSORIES

A. Install door frames, doors, overhead doors, and windows and glass in accordance with manufacturer's instructions.

B. Seal wall and roof accessories watertight and weather tight with sealant in accordance with Section 07900.

3.05 TOLERANCES

A. Framing Members: 1/4 inch from level; 1/8 inch from plumb.

B. Siding and Roofing: 1/8 inch from true position.

END OF SECTION

SECTION 15050

BASIC MECHANICAL MATERIALS AND METHODS

PART 1 GENERAL

1.01 SCOPE

A. All provisions of the Contract including the General and Supplementary Conditions and the General Requirements apply to this work.

B. The provisions of this section are applicable to HVAC and plumbing mechanical work. Refer to designated process specifications for work related to the process piping.

1.02 WORK INCLUDED

A. The work to be included in these and all other mechanical subsections shall consist of providing, installing, adjusting and setting into proper operation complete and workable systems for all items shown on the drawings, described in the specifications or reasonably implied. This shall include the planning and supervision to coordinate the work with other crafts and to maintain a proper time schedule for delivery of materials and installation of the work.

B. Division 1 of the specifications is to be specifically included as well as all related drawings.

1.03 RELATED WORK

A. Related Work Specified Elsewhere:
   1. Electrical Specifications: Division 16
   2. Motors and Connections: Division 16
   3. Starters and Disconnects: Division 16

B. Unless otherwise indicated on the electrical drawings or the electrical schedules, provide all mechanical equipment motors, motor starters, thermal overload switches, control relays, time clocks, thermostats, motor operated valves, float controls, damper motors, electric-pneumatic and pneumatic electric switches, electrical components, wiring and any other miscellaneous Division 15 controls. Disconnect switches are included in the electrical work, unless specifically called out on mechanical plans.

C. Carefully coordinate all work with the electrical work shown and specified elsewhere.

1.04 REFERENCED CODES - LATEST ADOPTED EDITION

A. NFPA 13 Installation of Sprinkler Systems

B. NFPA 70 National Electrical Code (NEC)

C. IMC International Mechanical Code

D. UPC Uniform Plumbing Code

E. IFC International Fire Code

F. IBC International Building Code

1.05 PROJECT RECORD DRAWINGS

A. In addition to other requirements of Division 1, mark up a clean set of drawings as the work progresses to show the dimensioned location and routing of all mechanical work which will become permanently concealed. Show routing of work in concealed blind spaces within the building.

B. Show the location of all valves and their appropriate tag identification.

C. At completion of project, deliver these drawings to the owner and obtain a written receipt.

D. At completion of project, deliver a CDROM or USB drive to the owner containing photographic documentation of all mechanical systems constructed. Provide photographic documentation of all mechanical systems under slab and within concealed spaces.

1.06 SUBMITTALS

A. See General Conditions and the General Requirements in Division 1 regarding submittals.

B. Submit by specification section complete and all at one time; partial submittals will not be considered. In addition to the electronic submittals required by Section 01300, provide two copies of submittals in booklet form. The data shall be arranged and indexed under basic categories. A typewritten index shall be included with dividers and identifying tabs between sections and references to sections of specifications.

C. Catalog sheets shall be complete and the item or model to be used shall be *clearly marked*, and identified as to which item in the specifications or on the drawings is being submitted and with drawing fixture number where applicable.

D. Only submit on items specifically required by each specification section. If a submittal has not been requested, it will not be reviewed.

1.07 HANDLING

A. See General Conditions and the General Requirements in Division 1 regarding material handling.

B. Deliver packaged materials to job site in unbroken packages with manufacturer's label, and store to facilitate inspection and installation sequence. All items must be labeled and identified as to make, size and quality.

1.08 SUBSTITUTIONS

A. In accordance with the General Conditions and the General Requirements in Division 1, Substitution and Product Options, all substitute items must fit in the available space, and be of equal or better quality including efficiency performance, size, and weight, and must be compatible with existing equipment. The owner shall be the final authority regarding acceptability of substitutes.

1.09 DIMENSIONS

A. Before ordering any material or doing any work, the Contractor shall verify all dimensions, including elevations, and shall be responsible for the correctness of the same. No extra charge or compensation will be allowed on account of differences between actual dimensions and measurements indicated on the drawings.

B. Any differences, which may be found, shall be submitted to the Owner’s representative for consideration before proceeding with the work.

1.10 MANUFACTURER'S DIRECTIONS

A. All manufactured articles shall be applied, installed and handled as recommended by the manufacturer, unless specifically called out otherwise in the plans. Advise the owner of any such conflicts before installation. PERMITS, FEES, ETC.

1.11 TESTING

A. The Contractor under each section shall, at his own expenses, perform the various tests as specified and required by the owner and as required by applicable code, the State, and local authorities. The Contractor shall furnish all fuel and materials necessary for making tests.

1.12 TERMINOLOGY

A. Whenever the words "furnish", "provide", "furnish and install", "provide and install", and/or similar phrases occur, it is the intent that the materials and equipment described be furnished, installed and connected under this Division of the Specifications, complete for operation unless specifically noted to the contrary.

B. Where a material is described in detail, listed by catalog number or otherwise called for, it shall be the Contractor's responsibility to furnish and install the material.

C. The use of the word "shall" conveys a mandatory condition to the contract.

D. "This section" refers to the section in which the statement occurs.

E. "The project" includes all work in progress during the construction period.

F. In describing the various items of equipment, in general, each item will be described singularly, even though there may be a multiplicity of identical or similar items.

1.13 SCHEDULE OF WORK

A. The work must be expedited and close coordination will be required in executing the work. The various trades shall perform their portion of the work at such times as directed so as to meeting scheduled completion dates, and to avoid delaying any other trade. Each contractor shall cooperate in establishing these times and locations and shall process his work so as to ensure the proper execution of it.

1.14 COOPERATION AND CLEANING UP

A. The contractor for the work under each section of the specifications shall coordinate his work with the work described in all other sections of the specifications to the end that, as a whole, the job shall be a finished one of its kind, and shall carry on his work in such a manner that none of the work under any section of these specifications shall be handicapped, hindered or delayed at any time.

B. At all times during the progress of the work, the Contractor shall keep the premises clean and free of unnecessary materials and debris. The Contractor shall, on direction at any time from the owner, clear any designated areas or area of materials and debris. On completion of any portion of the work, the Contractor shall remove from the premises all tools and machinery and all debris occasioned by the work, leaving the premises free of all obstructions and hindrances.

1.15 GUARANTEE

A. Unless a longer guarantee is hereinafter called for, all work, materials and equipment items shall be guaranteed for a period of one year after acceptance by the Owner. All defects in labor and materials occurring during this period, as determined by the Owner’s representative, shall be repaired and/or replaced to the complete satisfaction of the Owner’s representative. Guarantee shall be in accordance with Division 1.

1.16 COMPLETION REQUIREMENTS

A. In accordance with the General Conditions and the General Requirements in Division 1, Project Closeout; before acceptance and final payment, the Contractor shall furnish:
   1. Accurate project record drawings, shown in red ink on blueline prints, showing all changes from the original plans made during installation of the work.
   2. Photographic documentation of mechanical systems.
   3. All manufacturer's guarantees.
   4. Warranties.
   5. Spare parts.
   6. Test and balance reports.
   7. Operation and maintenance manuals.

PART 2 PRODUCTS

2.01 MATERIALS

A. All equipment shall be regularly cataloged items of the manufacturer and shall be supplied as a complete unit in accordance with the manufacturer's standard specifications along with any optional items required for proper installation unless otherwise noted. Maintain manufacturer's identification, model number, etc. on all equipment at all times.

B. Where more than one of an item is to be provided, all of the items shall be identical manufacture, make, model, color, etc.

2.02 ELECTRICAL MOTORS

C. Motors: Furnish electric motors designed for the specific application and duty applied, and to deliver rated horsepower without exceeding temperature ratings when operated on power systems with a combined variation in voltage and frequency not more than + 10% of rated voltage. Motors for pumps and fans shall be selected to be non-overloading.

D. Verify from the drawings and specifications the available electrical supply characteristics and furnish equipment that will perform satisfactorily under the conditions shown and specified.

E. Size motors for 1.15 service factor and not to exceed 40º C temperature rise above ambient.

F. Fractional horsepower motors to have self-resetting thermal overload switch.

G. Provide Premium Efficiency, motors for all three phase motors one horsepower and larger. Standard efficiency motors will not be acceptable.

2.03 RESTRICTED MATERIALS

A. No materials containing asbestos in any form shall be allowed. Where materials or equipment provided by this Contractor are found to contain asbestos, such items shall be removed and replaced with non-asbestos items. Entire cost of asbestos removal and disposal and cost of installing new items shall be the responsibility of the Contractor for those asbestos containing items installed by the Contractor.

B. No solder or flux containing lead shall be used on this project.

2.04 PIPE HANGERS AND SUPPORTS

A. All HVAC and plumbing hangers and supports shall be hot-dipped galvanized per ASTM A153/A153M.

B. Hangers or Wall Supports for ½" - 1" Copper Pipe: Copper horn type "Amtrol Van Hangers," sized for pipe supported.

C. Hangers for Pipe Sizes ½ to 1-½ Inch: Hot-dipped galvanized per ASTM A153/A153M, adjustable swivel, split ring for steel pipe, copper swivel for copper pipe.

D. Hangers for Hot Pipe Sizes 2 to 4 Inches and Cold Pipe Sizes 2 Inches and Larger: Hot-dipped galvanized per ASTM A153/A153M, adjustable, clevis.

E. Multiple or Trapeze Hangers: Hot-dipped galvanized per ASTM A153/A153M channels or strut with hanger rods. Wall Support for Pipe Sizes to 3 Inches: Strut triangular bracket with pipe clamp and cushion insulator.

F. Wall Support for Pipe Sizes 4 Inches and Over: Welded hot-dipped galvanized per ASTM A153/A153M bracket and wrought steel clamp; adjustable steel yoke and cast iron roll for hot pipe sizes 6 inches and over.

G. Vertical Support: Hot-dipped galvanized per ASTM A153/A153M riser clamp.

H. Copper Pipe Support: Hot-dipped galvanized per ASTM A153/A153M ring, adjustable, copper plated with felt isolation pad or all copper ring or swivel.

I. Shield for Insulated Piping 2 Inches and Larger: Hard block calcium silicate insert in 180º segments, 12 inch minimum length, block thickness same as insulation thickness, flame resistant vapor barrier covering and 18 gauge galvanized shield.

J. Shield for Insulated Piping 1-½ Inches and Smaller: 18 gauge hot-dipped galvanized per ASTM A153/A153M shield, over insulation in 180º segments, minimum 12 inches long at pipe support.

K. Design hangers to allow installation without disengagement of supported pipe.

2.05 HANGER RODS

A. Steel Hanger Rods: Hot-dipped galvanized per ASTM A153/A153M. Threaded both ends, or continuous threaded.

2.08 FLASHING

A. Metal Flashing: 26-gauge minimum galvanized steel.

B. Flexible Flashing: 47-mil thick sheet butyl, compatible with roofing.

C. Caps: Steel, 22-gauge minimum; 16 gauge at fire resistant elements.

2.10 SLEEVES

A. Sleeves for Pipes Through Non-fire Rated Floors: Form with 18 gauge galvanized steel for 4 inch diameter and larger, 22 gauge up to 3" diameter.

B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Form with steel pipe or 18 gauge galvanized steel for 4 inch diameter and larger, 22 gauge up to 3" diameter.

C. Sleeves for Pipes Through Fire Rated and Fire Resistive Floors and Walls, and Fireproofing: Prefabricated fire rated sleeves including seals, UL listed caulking system.

D. Sleeves for Round Ductwork: Form with galvanized steel.

E. Sleeves for Rectangular Ductwork: Form with galvanized steel.

F. Fire Stopping Insulation: Mineral fiber type, non- combustible.

G. Caulk: Fire stop sealant in compliance with ASTM E814, UL 1479 and Division 7.

2.11 ACCEPTABLE MANUFACTURERS: VIBRATION ISOLATORS

A. Vibration isolators shall be manufactured by:
   1. Mason Industries.
   2. Kordund, Westery, New York.
   3. Consolidated Kinetics Corporation, Columbus, Ohio.

B. Ventilating equipment flexible connections and duct flexible connections shall be:
   1. DuroDyne Dynalon or equal.
   2. Ventfabrics, Chicago, Illinois.
   3. Elgen Manufacturing Co., Garfield, New Jersey.

C. Substitutions: Items of same function and performance are acceptable in conformance with Division 1.

2.12 VIBRATION ISOLATORS (ROTATING EQUIPMENT EXCEPT FANS)

A. Floor Mount: Closed spring mount with iso-stiff springs and limit stop for seismic restraint. Isolators are to be sized and selected by equipment manufacturer.

B. Hangers: Closed spring hanger with acoustic isolator.

C. Provide pairs of neoprene side snubbers or restraining springs where side torque or thrust may develop.

D. Color code spring mounts, spring selected to operate at no greater than 2/3 solid deflection and have ¼" ribbed neoprene pads.

2.13 FAN ISOLATION

A. Provide spring type isolators for fans and heating and ventilation units.

B. Spring isolators shall be free standing and laterally stable without any housing and complete with a molded neoprene cup or ¼ inch neoprene acoustical friction pad between the baseplate and the support. All mountings shall have leveling bolts that must be rigidly bolted to the equipment. Spring diameters shall be not less than 0.8 of the compressed height of the spring at rated load. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection.

C. Seismically restrained spring isolators shall be as described above, built into a ductile iron or steel housing to provide all directional seismic snubbing. The snubber shall be adjustable vertically and allow a maximum of ¼ inch travel in all directions before contacting the resilient snubbing collars. Mountings shall be SSLFH as manufactured by Mason Industries.

D. Cabinet unit heaters, panel fans, and other ventilation units mounted to solid ductwork or structure shall be internally factory isolated.

2.14 VENTILATING SYSTEMS FLEXIBLE CONNECTIONS

A. Fabricate of neoprene coated flameproof fabric a minimum of 2" wide tightly crimped into metal edging strip and attach to ducting and equipment by screws or bolts at 6" intervals. DuroDyne Dynalon treated duct material, or equal. Durolon or equal for outdoor or high pressure applications.

2.15 LIMITS OF VIBRATION

A. The factory is to statically and dynamically balance all rotating machinery, fans and pumps, etc. Do dynamic balancing at the operating speed of the motor.

B. Select isolated equipment in accordance with the weight distribution, to produce uniform deflection on the vibration mounts. Deflection of vibration mounts shall be required to produce 95% vibration isolation efficiency, based on the equipment HP, rpm, location in regard to critical spaces and stiffness of the building supporting structural members, supporting the equipment.

C. For fan-motor units in which the impeller is supported by the motor shaft, the motor and impeller shall be dynamically balanced as an integral unit.

2.16 EARTHQUAKE BUMPERS AND SNUBBERS

A. Bumpers:
   1. Fabricate the bumper cradle of 6 X 4 X 3/8" angle iron minimum and provide with at least two holes for bolting to the floor.
   2. Attach one or more elastomeric mountings to pad the 6" leg of the angle iron.
   3. Design the mounting to deflect not more than ¾" under the shock loading of 1 g in any direction in the horizontal plane.
   4. Manufacturer: Vibration Mounting Series "SR" seismic restraints, or similar.

B. Snubbers:
   1. Interlocking steel members restrained by shock absorbent rubber materials.
   2. Elastomeric materials shall be replaceable and a minimum of ¾” thickness.
   3. Maintain 1/8” air gap in all directions in design of snubber.
   4. Acceleration of 4 g’s in any direction.
   5. All-directional restraint.
   6. Manufacturer: Mason Industries Z-1011 Seismic Snubber.

PART 3 EXECUTION

3.01 DRAWINGS

A. The mechanical drawings are generally diagrammatic. Complete details of the building, which affect the mechanical installation, may not be shown. For additional details, see Architectural, Civil and Electrical Drawings. Coordinate work under this section with that of all related trades.

3.02 INSTALLATION

A. All work shall comply with the latest adopted applicable codes and ordinances including, but not limited to, the NFPA, IMC, IFC, UPC, and IBC Standards; all local and state amendments to all codes and standards.

B. Obtain and pay for all inspection fees, connection charges and permits as a part of the Contract.

C. Compliance with codes and ordinances shall be at the Contractor's expense.

3.03 MEASUREMENTS

A. Verify all measurements on the job site.

B. Locate all equipment and fixtures on the centers of walls, openings, spaces, etc., unless specified otherwise.

C. Check all piping, ducts, etc. to clear openings.

D. Rough-in dimensions shall be per manufacturer's recommendations and in compliance with ADA Guidelines.

3.04 OPERATING INSTRUCTIONS

A. Before the facility is turned over to the Owner, instruct the Owner or Owner's personnel in the operation, care and maintenance of all systems and equipment under the jurisdiction of the

Mechanical Division. These instructions shall also be included in a written summary in the Operating Maintenance Manuals.

B. The Operation and Maintenance Manuals shall be utilized for the basis of the instruction. Provide a minimum of eight hours of onsite instruction to the owner designated personnel.

3.05 OPERATING AND MAINTENANCE MANUALS

A. Submit maintenance manuals to the Engineer covering all equipment, fixtures, devices, etc. installed by the Contractor. Submit prior to substantial completion.

B. The operation and maintenance manuals shall be bound in a loose leaf three ring binder with reinforced holes in the sheets so as to prevent lost pages. The operation and maintenance manuals shall also be provided to the owner in an electronic format. The manual shall contain, but not limited to, the following types of information:
   1. Cover sheet with name, address, telephone number of Contractor, General Contractor and major equipment suppliers.
   2. Catalog cuts of all equipment, fixtures, etc. installed (Marked to identify the specific items used).
   3. Manufacturer's maintenance and overhaul instruction booklets including exploded views.
   4. Identification numbers of all parts and nearest sources for obtaining parts and services.
   5. Reduced scale drawings of the control system and a verbal description of how these controls operate.
   6. A copy of the final test and balance report.
   7. A copy of valve schedule and reduced scale drawings showing valve locations.
   8. Written summary of instructions to Owner.

C. A periodic maintenance form that includes all of the equipment shall be provided with the maintenance manual. The form shall list each piece of equipment and how often maintenance is required (daily, weekly, monthly, annually). Opposite each task shall be squares for check-off for a full year (initials) to verify that the tasks are being done.

3.06 IDENTIFICATION

A. In accordance with Section 15190, Mechanical Identification.

3.07 SYSTEM ADJUSTING

A. In accordance with Section 15990 Testing, Adjusting and Balancing.

3.08 CUTTING, FITTING, REPAIRING, PATCHING AND FINISHING

A. Arrange and pay for all cutting, fitting, repairing, patching and finishing of work by other trades where it is necessary to disturb such work to permit installation of mechanical work. Perform work only with craftsmen skilled in their respective trades.

B. Avoid cutting, insofar as possible, by setting sleeves, frames, etc. and by requesting openings in advance. Assist other trades in securing correct location and placement of rough-frames, sleeves, openings, etc. for ducts and piping.

C. Cut all holes neatly and as small as possible to admit work. Include cutting where sleeves or openings have been omitted. Perform cutting in a manner so as not to weaken walls, partitions or floors. Drill holes required to be cut in floors without breaking out around holes.

3.09 PAINTING

A. Perform all of the following painting in accordance with provisions of Division 9 with colors as selected by the Architect. Provide the following items as a part of mechanical work:
   1. Factory applied prime and finish coats on mechanical equipment.
   2. Factory applied prime and finish coat on all air registers, grilles and diffusers, unless otherwise specified.
   3. Factory applied prime coat on access doors.
   4. Pipe identification where specified.

B. If factory finish on any equipment furnished is damaged in shipment or during construction, refinish to equal original factory finish.

3.10 INSTALLATION OF EQUIPMENT

A. Unless otherwise indicated, mount all equipment and install in accordance with manufacturer's recommendations and approved submittals.

B. Maintain manufacture recommended minimum clearances for access and maintenance.

C. Where equipment is to be anchored to structure, furnish and locate necessary anchoring and vibration isolation devices.

D. Furnish all structural steel, such as angles, channels, beams, etc. required to support all piping, ductwork, equipment and accessories installed under this Division. Use structural supports suitable for equipment specified or as indicated. In all cases, support design will be based upon data contained in manufacturer's catalog.

E. Openings: Arrange for necessary openings in buildings to allow for admittance and reasonable maintenance or replacement of all apparatus furnished under this Contract.

F. Access Doors: Provide as necessary for reasonable maintenance of all equipment valves, controls, etc.

3.11 PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as follows:

PIPE SIZE	MAX. HANGER SPACING	HANGER DIAMETER
½ to 1-¼ inch	6'-0"	3/8"
1-½ to 2 inch	10'-0"	3/8"
2-½ o 3 inch	10'-0"	½"
4 to 6 inch	10'-0"	5/8"
8 to 12 inch	14'-0"	7/8"
14 inch and Over	20'-0"	1"
PVC (All Sizes)	4'-0"	3/8"
C.I. Bell and Spigot or No-Hub	5'-0" and at joints	5/8"

B. Install hangers to provide minimum ½ inch space between finished covering and adjacent work.

C. Place a hanger within 12 inches of each horizontal elbow.

D. Use hangers with 1-½ inch minimum vertical adjustment.

E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.

F. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.

G. Where several pipes can be installed in parallel and at the same elevation, provide multiple or trapeze hangers.

H. Support riser piping independently of connected horizontal piping.

I. Provide transverse seismic support for all piping systems.

3.12 EQUIPMENT BASES AND SUPPORTS

A. Provide equipment bases of concrete type where shown on plans.

B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.

C. Construct support of steel members. Brace and fasten with flanges bolted to structure.

D. Provide rigid anchors for pipes after vibration isolation components are installed.

3.13 FLASHING

A. Provide flexible flashing and metal counter-flashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.

B. Flash vent pipes projecting 3 inches minimum above finished roof surface with pre-manufactured butyl boot.

C. Seal floor drains watertight to adjacent materials.

3.14 SLEEVES

A. Provide product submittals for an approved system to be used for all penetrations through fire-rated assemblies, interior or exterior.

B. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

C. Set sleeves in position in construction. Provide reinforcing around sleeves.

D. Extend sleeves through floors one inch above finished floor level. Caulk sleeves full depth and provide floor plate.

E. Where piping or ductwork penetrates floor, ceiling, or wall, install sleeve, close off space between pipe or duct and adjacent work with fire stopping insulation and caulk seal. Use fire rated caulking where fire rated walls are penetrated. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

F. Install chrome plated steel escutcheons at finished surfaces.

3.15 SCOPE OF ISOLATION AND RESTRAINT WORK

A. All vibrating equipment and the interconnecting pipe and ductwork shall be isolated to eliminate the transmission of objectionable noise and vibration from the structure.

B. Mechanical equipment shall be carefully checked upon delivery for proper mechanical performance, which shall include proper noise and vibration operation.

C. All installed rotating equipment with excessive noise and/or vibration, which cannot be corrected in place, shall be replaced at no cost to Owner.

3.16 GENERAL PROCEDURES - ISOLATION AND RESTRAINT

A. Select isolators in accordance with the manufacturer's recommendations and the equipment weight distribution to allow for proper static deflection of the isolators in relation to the span of the building structure supporting the equipment, considering the allowable deflection and weight of the structure.

B. Install isolators so they can be easily removed for replacement.

C. Mount all equipment absolutely level.

D. Install all isolators per manufacturer's instructions.

E. Install vibration isolators for mechanical motor driven equipment.

F. Set steel bases for 1" clearance between housekeeping pad and base.

3.18 PIPING - ISOLATION

A. Piping vibration isolation flexible connections shall be installed at a 90° angle to equipment deflection direction unless otherwise noted.

END OF SECTION

SECTION 15190

MECHANICAL IDENTIFICATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Identification of mechanical products installed under Division 15.

1.02 REFERENCES

A. ANSI/ASME A13.1 - Scheme for the Identification of Piping Systems.

1.03 SUBMITTALS

A. Submit product data under provisions of Division 1.

B. Include product data on: Nameplates, tags and pipe markers.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Seton.

B. Marking Services Inc.

C. Brady.

D. Substitutions: Under provisions of Division 1.

2.02 MATERIALS

A. Color: Unless specified otherwise, conform with ANSI/ASME A13.1.

B. Plastic Nameplates: Laminated three-layer plastic with engraved black or white letters on contrasting background color. Plate size minimum ¾" X 2-½".

C. Plastic Tags: Laminated three-layer plastic with engraved black or white letters on contrasting background color. Tag size minimum 1-½ inch square.

D. Metal Tags: Brass with stamped letters; tag size minimum 1-½ inch diameter with smooth edges.

E. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and fluid being conveyed.

F. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

G. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape of not less than 6 inch wide by 4 mil thick, manufactured for direct burial service.

H. Valve Chart Frame: Seton #A11P aluminum frame with plastic windows.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

A. Plastic Nameplates: Install with corrosive-resistant mechanical fasteners, or adhesive.

B. Plastic or Metal Tags: Install with corrosive-resistant bead type chain.

C. Plastic Pipe Markers: Install in accordance with manufacturer's instructions.

D. Plastic Tape Pipe Markers: Install complete with minimum two strips of adhesive direction arrow tape around pipe in accordance with manufacturer's instructions.

E. Underground Plastic Pipe Markers: Install 6 to 8 inches below finished grade, directly above all buried pipe.

F. Equipment: Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with plastic or metal tags.

G. Controls: Identify control panels and major control components outside panels with plastic nameplates.

H. Valves: Identify valves in main and branch piping with brass tags showing service and valve number. Brass valve tags shall be chained to valve stem.

I. Piping: Identify piping, concealed or exposed, with plastic tape pipe markers. Tags may be used on small diameter piping. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and "T", at each side of penetration of structure or enclosure, and at each obstruction.

J. Ductwork: Identify ductwork with plastic nameplates. Identify as to air handling unit number, and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.

K. Locations: Nameplates shall be located to be readily visible to maintenance personnel. Motor nameplates shall be readily visible on accessible, three phase motors, otherwise a duplicate motor nameplate shall be permanently affixed to the driven machinery in a visible locations.

3.03 VALVE CHART AND SCHEDULE

A. Provide and install valve chart and schedule at location as directed. Chart shall show valve number, service and normal position. Provide a reduced scale copy of drawings showing valves and valve number. Provide copies of valve chart and drawings for inclusion in operation and maintenance manuals in accordance with Section 15050.

END OF SECTION

SECTION 15200
PROCESS - GENERAL PIPING

PART 1 GENERAL

This specification applies to all piping used within the Pyramid Water Treatment Plant. Unless otherwise specified, all piping and related materials (valves, elbows, tees, fixtures, gaskets, etc.) used in the piping system must be NSF 61 approved. All piping used in is intended for contact with drinking water and must be suitable for that application including meeting any specifications and standards beyond NSF 61 required by the State of Alaska.

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section and any supplemental Data Sheets:
   1. American Association of State Highway and Transportation Officials (AASHTO): HB-17, Standard Specifications for Highway Bridges.
   2. American Society of Mechanical Engineers (ASME):
      a. B1.20.1, Pipe Threads, General Purpose (Inch).
      b. B16.1, Gray Iron Pipe Flanges and Flanged Fittings (Classes 25, 125, and 250).
      c. B16.3, Malleable Iron Threaded Fittings Classes 150 and 300.
      d. B16.5, Pipe Flanges and Flanged Fittings NPS 1/2 through NPS 24 Metric/Inch Standard.
      e. B16.9, Factory-Made Wrought Buttwelding Fittings.
      f. B16.11, Forged Fittings, Socket-Welding and Threaded.
      g. B16.15, Cast Bronze Threaded Fittings Classes 125 and 250.
      h. B16.21, Nonmetallic Flat Gaskets for Pipe Flanges.
      i. B16.22, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
      j. B16.24, Cast Copper Alloy Pipe Flanges and Flanged Fittings: Class 150, 300, 400, 600, 900, 1500, and 2500.
      k. B16.25, Butt Welding Ends.
      l. B16.42, Ductile Iron Pipe Flanges and Flanged Fittings Classes 150 and 300.
      m. B31.3, Process Piping.
      n. B31.9, Building Services Piping.
      o. B36.10M, Welded and Seamless Wrought Steel Pipe.
      p. B36.19M, Stainless Steel Pipe.
      q. D3222, Type 1 homopolymers
      r. D2467, Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
      s. D1785, Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
   3. American Society for Nondestructive Testing (ASNT): SNT-TC-1A, Personnel Qualification and Certification in Nondestructive Testing.
   4. American Water Works Association (AWWA):
      a. C104/A21.4, Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
      b. C105/A21.5, Polyethylene Encasement for Ductile-Iron Pipe Systems.
      c. C110/A21.10, Ductile-Iron and Gray-Iron Fittings for Water.
      d. C111/A21.11, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
      e. C115/A21.15, Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
      f. C116/A21.16, Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings for Water Supply Service.
      g. C151/A21.51, Ductile-Iron Pipe, Centrifugally Cast, for Water.
      h. C153/A21.53, Ductile-Iron Compact Fittings for Water Service.
      i. C207, Steel Pipe Flanges for Waterworks Service, Sizes 4 In. Through 144 In. (100 mm Through 3,600 mm).

k. C651, Disinfecting water mains.
l. C600, Hydrostatic testing of pipelines.

5. American Welding Society (AWS)
   a. AWS D18.1, Specification for Welding of Austenitic Stainless Steel Tube and Pipe Systems for Sanitary (Hygienic) Applications

5. ASTM International (ASTM):
   a. A47/A47M, Standard Specification for Ferritic Malleable Iron Castings.
   b. A126, Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
   c. A153/A153M, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   d. A183, Standard Specification for Carbon Steel Track Bolts and Nuts.
   e. A197/A197M, Standard Specification for Cupola Malleable Iron.
   f. A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
   g. A536, Standard Specification for Ductile Iron Castings.
   h. A563, Standard Specification for Carbon and Alloy Steel Nuts.
   i. A743/A743M, Standard Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion Resistant, for General Application.
   j. A744/A744M, Standard Specification for Castings, Iron-Chromium-Nickel, Corrosion Resistant, for Severe Service.
   k. B32, Standard Specification for Solder Metal.
   l. B43, Standard Specification for Seamless Red Brass Pipe, Standard Sizes.
   m. B61, Standard Specification for Steam or Valve Bronze Castings.
   n. B62, Standard Specification for Composition Bronze or Ounce Metal Castings.
   o. B75, Standard Specification for Seamless Copper Tube.
   p. B88, Standard Specification for Seamless Copper Water Tube.
   q. B98/B98M, Standard Specification for Copper-Silicon Alloy Rod, Bar and Shapes.
   r. B462, Standard Specification for Forged or Rolled UNS N06030, UNS N06022, UNS N06035, UNS N06200, UNS N06059, UNS N06686, UNS N08020, UNS N08024, UNS N08026, UNS N08367, UNS N10276, UNS N10665, UNS N10675, UNS N10629, UNS N08031, UNS N06045, UNS N06025, and UNS R20033 Alloy Pipe Flanges, Forged Fittings, and Valves and Parts for Corrosive High-Temperature Service.
   s. B464, Standard Specification for Welded UNS N08020, N08024, and N08026 Alloy Pipe.
   t. B474, Standard Specification for Electric Fusion Welded Nickel and Nickel Alloy Pipe.
   u. C582, Standard Specification for Contact-Molded Reinforced Thermosetting Plastic (RTP) Laminates for Corrosion-Resistant Equipment.
   v. D412, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers Tension.
   w. D413, Standard Test Methods for Rubber Property Adhesion to Flexible Substrate.
   x. D543, Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents.
   y. D1248, Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable.
   a`. D1330, Standard Specification for Rubber Sheet Gaskets.
   aa. D1784, Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
   ab. D1785, Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
   ac. D2464, Standard Specification for Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.

ad. D2466, Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
ae. D2467, Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
af. D2564, Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems.
ag. D2837, Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products.
ah. F436, Standard Specification for Hardened Steel Washers.
ai. F593, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
aj. F656, Standard Specification for Primers for Use in Solvent Cement Joints of Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings.

6. Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS): SP-43, Wrought Stainless Steel Butt-Welding Fittings.
7. NSF International (NSF): 61 Drinking Water System Components- Health Effects.
8. National Electrical Manufacturers Association (NEMA): LI 1, Industrial Laminating Thermosetting Products.
9. National Fire Protection Association (NFPA): 24, Standard for the Installation of Private Fire Service Mains and Their Appurtenances.

1.02 DESIGN REQUIREMENTS

A. Where pipe diameter, thickness, pressure class, pressure rating, or thrust restraint is not shown or specified, design piping system in accordance with the following:
1. Process Piping: ASME B31.3, normal fluid service unless otherwise specified.
2. Building Service Piping: ASME B31.9, as applicable.
3. Sanitary Building Drainage and Vent Systems: ICC International Plumbing Code.
4. Buried Piping: H20-S16 traffic load with 1.5 impact factor, AASHTO HB-17, as applicable.

1.03 SUBMITTALS

A. Action Submittals:
1. Shop Fabricated Piping:
a. Detailed pipe fabrication or spool drawings showing special fittings and bends, dimensions, coatings, and other pertinent information.
b. Layout drawing showing location of each pipe section and each special length; number or otherwise designate laying sequence on each piece.
c. Hydraulic Thrust Restraint for Restrained Joints: Details including materials, sizes, assembly ratings, and pipe attachment methods.
d. Pipe Corrosion Protection: Product data.
e. Seismic anchorage and bracing drawings and cut sheets, as required by Section 01 88 15, Seismic Anchorage and Bracing.
2. Informational Submittals:
a. Manufacturer's Certification of Compliance:
b. Pipe and fittings.
c. Factory applied resins and coatings.
d. Pipe coating applicator certification.
3. Certifications from an accredited organization on all materials and fixtures used that they are suitable for contact with drinking water in accordance with NSF 61.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Flanges: Securely attach metal, hardboard, or wood protectors over entire gasket surface.

B. Threaded or Socket Welding Ends: Fit with metal, wood, or plastic plugs or caps.

C. Linings and Coatings: Prevent excessive drying.

D. Cold Weather Storage: Locate products to prevent coating from freezing to ground.

E. Handling: Use heavy canvas or nylon slings to lift pipe and fittings.

PART 2 PRODUCTS

2.01 PIPING

A. As specified on Piping Data Sheet(s) located on the drawings.

B. Diameters Shown:
   1. Standardized Products: Nominal size.

2.02 JOINTS

A. Flanged Joints:
   1. Flat-faced, carbon steel, or alloy flanges when mating with flat-faced cast or ductile iron flanges.
   2. Higher pressure rated flanges as required to mate with equipment when equipment flange is of higher pressure rating than required for piping.
   3. Threaded Joints: NPT taper pipe threads in accordance with ASME B1.20.1.
   4. Mechanical Joint Anchor Gland Follower:
      a. Ductile iron anchor type, wedge action, with breakoff tightening bolts. Thrust rated to 250 psi minimum. Rated operating deflection not less than 2-1/2 degrees. UL and FMG approval

2.03 MANUFACTURERS AND PRODUCTS:

A. EBAA Iron Inc.; Megalug.

B. Romac Industries, Inc.; RomaGrip.

C. Ford Meter Box Co.; Series 1400.

2.04 GASKET LUBRICANT

A. Lubricant shall be supplied by pipe manufacturer and no substitute or "or-equal" will be allowed.

2.05 PIPE CORROSION PROTECTION

A. Coatings: there are to be no coatings applied to any stainless steel or PVDF piping and fixtures.

B. Polyethylene Encasement (Bagging) (where applicable):
   1. Encasement Tube: Black polyethylene encasement tube, 8 mils minimum thickness, conforming to AWWA C105/A21.5, Class C, free of gels, streaks, pinholes, foreign matter, undispersed raw materials, and visible defects such as tears, blisters, and thinning at folds.
   2. Securing Tape: Thermoplastic tape, 8 mils minimum thickness, 1 inch wide, pressure sensitive adhesive face capable of bonding to metal, bituminous coating, and polyethylene encasement tube.

2.06 FABRICATION

A. Mark each pipe length on outside with the following:
   1. Size or diameter and class.
   2. Manufacturer's identification and pipe serial number.
   3. Location number on laying drawing.
   4. Date of manufacture.
   5. Code markings according to approved Shop Drawings.
   6. Where possible, flanged pipe shall be fabricated in the shop, not in the field, and delivered to the Site with flanges in place and properly faced. Threaded flanges shall be individually fitted and machine tightened on matching threaded pipe by the manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify size, material, joint types, elevation, horizontal location, and pipe service of existing pipelines to be connected to new pipelines or new equipment.

B. Inspect size and location of structure penetrations to verify adequacy of wall pipes, sleeves, and other openings.

3.02 PREPARATION

A. Notify Owner's Representative at least 2 weeks prior to field fabrication of pipe or fittings.

B. Inspect pipe and fittings before installation, clean ends thoroughly, and remove foreign matter and dirt from inside.

C. Damaged Coatings and Linings: Repair using original coating and lining materials in accordance with manufacturer's instructions.

3.03 INSTALLATION-GENERAL

A. Join pipe and fittings in accordance with manufacturer's instructions, unless otherwise shown or specified.

B. Remove foreign objects prior to assembly and installation.

C. Flanged Joints:
   1. Install perpendicular to pipe centerline.
   2. Bolt Holes: Straddle vertical centerlines, aligned with connecting equipment flanges or as shown.
   3. Use torque-limiting wrenches to ensure uniform bearing and proper bolt tightness.
   4. Plastic Flanges: Install annular ring filler gasket at joints of raised-face flange.
   5. Grooved Joint Flange Adapters: Include stainless steel washer plates as required for mating to serrated faces and lined valves and equipment.
   6. Raised-Face Flanges: Use flat-face flange when joining with flat-faced ductile or cast iron flange.
   7. Verify compatibility of mating flange to adapter flange gasket prior to selecting grooved adapter flanging.
   8. Flange fillers are to be avoided, but if necessary, may be used to make up for small angles up to 6 degrees and for filling gaps up to 2 inches between flanges. Stacked flange fillers shall not be used.
   9. Threaded flanged joints shall be shop fabricated and delivered to Site with flanges in-place and properly faced.
      a. Manufacturer: Same as pipe manufacturer.
   10. Soldered Joints:
      a. Use only solder specified for particular service.
      b. Cut pipe ends square and remove fins and burrs.
      c. After thoroughly cleaning pipe and fitting of oil and grease using solvent and emery cloth, apply noncorrosive flux to the male end only.
      d. Wipe excess solder from exterior of joint before hardened.
      e. Before soldering, remove stems and washers from solder joint valves.

D. PVC Piping:
   1. Provide Schedule 80 threaded nipple where necessary to connect to threaded valve or fitting.
   2. Use strap wrench for tightening threaded plastic joints. Do not overtighten fittings.
   3. Do not thread Schedule 40 pipe.

3.04 INSTALLATION-EXPOSED PIPING

A. Piping Runs:
   1. Parallel to building or column lines and perpendicular to floor, unless shown otherwise.
   2. Piping upstream and downstream of flow measuring devices shall provide straight lengths as required for accurate flow measurement.
   3. Supports: As specified in Section 15065 Stainless Steel Pipe and Fittings.

B. Group piping wherever practical at common elevations; install to conserve building space and not interfere with use of space and other work.

C. Unions or Flanges: Provide at each piping connection to equipment or instrumentation on equipment side of each block valve to facilitate installation and removal.

D. Wall penetrations: Couplings shall be installed on exposed piping at walls, valves, and equipment to allow disassembly of the piping unless otherwise specified. Unions shall be employed on piping 2 inches and smaller. Flanged or grooved-end couplings joints shall be employed on piping 3 inches and larger. Where piping passes through walls, couplings shall be provided within 2 feet of wall. A coupling shall be provided within 2 feet of each threaded-end valve unless the valve can otherwise be easily removed from the piping.

E. Install piping so that no load or movement in excess of that stipulated by equipment manufacturer will be imposed upon equipment connection; install to allow for contraction and expansion without stressing pipe, joints, or connected equipment.
   1. Piping clearance, unless otherwise shown:
   2. Over Walkway and Stairs: Minimum of 7 feet 6 inches, measured from walking surface or stair tread to lowest extremity of piping system including flanges, valve bodies or mechanisms, insulation, or hanger/support systems.
   3. Between Equipment or Equipment Piping and Adjacent Piping: Minimum 3 feet, measured from equipment extremity and extremity of piping system including flanges, valve bodies or mechanisms, insulation, or hanger/support systems.
   4. From Adjacent Work: Minimum 1 inch from nearest extremity of completed piping system including flanges, valve bodies or mechanisms, insulation, or hanger/support systems.
   5. Do not route piping in front of or to interfere with access ways, ladders, stairs, platforms, walkways, openings, doors, or windows.
   6. Headroom in front of openings, doors, and windows shall not be less than the top of the opening.
   7. Do not install piping containing liquids or liquid vapors in transformer vaults or electrical equipment rooms.
   8. Do not route piping over, around, in front of, in back of, or below electrical equipment including controls, panels, switches, terminals, boxes, or other similar electrical work.

3.05 THRUST RESTRAINT

A. Location:
   1. Buried Piping: Where shown and where required to restrain force developed at pipeline tees, plugs, caps, bends, and other locations where unbalanced forces exist because of hydrostatic testing and normal operating pressure.
   2. Exposed Piping: At all joints in piping.

B. Mechanical Joint Valve Restraint in Proprietary Restrained Joint Piping: Install pipe joint manufacturer's adapter gland follower and pipe end retainer, or mechanical joint anchor gland follower.

3.06 BRANCH CONNECTIONS

A. When line of lower pressure connects to a line of higher pressure, requirements of Piping Data Sheet for higher pressure rating prevails up to and including the first block valve in the line carrying the lower pressure, unless otherwise shown.

B. Threaded Pipe Tap Connections:
   1. Ductile Iron Piping: Connect only with service saddle or at a tapping boss of a fitting, valve body, or equipment casting.
   2. Limitations: Threaded taps in pipe barrel are unacceptable.

3.07 VENTS AND DRAINS

A. Vents and drains at high and low points in piping required for completed system may or may not be shown. Install vents on high points and drains on low points of pipelines at all low and high point locations.

3.08 DISINFECTION

A. All pipe used shall be disinfected per AWWA C651.

3.09 PIPE IDENTIFICATION

A. As specified in Sections 09900, Painting and Coating, and 15 190, Mechanical Identification.

3.10 FIELD QUALITY CONTROL

A. Piping shall be hydrostatically tested per AWWA C600.

3.11 CLEANING

A. Following assembly and testing, and prior to disinfection and final acceptance, flush pipelines (except as stated below) with water at 2.5 fps minimum flushing velocity until foreign matter is removed.

B. If impractical to flush large diameter pipe at 2.5 fps velocity, clean in-place from inside by brushing and sweeping, then flush or blow line at lower velocity.

C. Insert cone strainers in flushing connections to attached equipment and leave in-place until cleaning is complete.

D. Remove accumulated debris through drains 2 inches and larger or by removing spools and valves from piping.

END OF SECTION

SECTION 15214

PROCESS - PRESSURE INDICATING TRANSMITTERS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish, test, install and place in satisfactory operation the pressure indicating transmitters, with all spare parts, accessories, and appurtenances as herein specified and as shown on the Drawings.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Control and Information System Scope and General Requirements

B. Powered Instruments, General

PART 2 -- PRODUCTS

2.01 PRESSURE INDICATING TRANSMITTERS

A. Pressure transmitters shall be specifically designed for pressure flow measurement when use with primary elements. They shall be capacitance type with a process-isolated diaphragm with silicone oil fill, microprocessor-based "smart" electronics, and a field adjustable rangedown of 200:1. Span and zero shall be continuously adjustable externally over the entire range. Span and zero adjustments shall be capable of being disabled internally. Transmitters shall be NEMA 4X weatherproof and corrosion resistant construction with low-copper aluminum body and 316 stainless steel process wetted parts. Accuracy, including nonlinearity, hysteresis and repeatability errors shall be plus or minus 0.04 percent of reading over a 8:1 flow range. The maximum zero elevation and maximum zero suppression shall be adjustable to anywhere within sensor limits. Output signal shall be linear to flow isolated 4-20 madc. Power supply shall be 12 to 43.5 VDC, two-wire design. Each transmitter shall be furnished with a 7-digit LCD indicator capable of displaying flow rate, engineering units, percent of range, and/or milliamps at user selectable update rates. Static Pressure limit is 3626 psig. Environmental limits shall be -40 to 250 degrees Fahrenheit at 0-100% relative humidity. Each transmitter shall have a stainless steel tag with calibration data attached to body.

B. The capacitance pressure sensor shall be mechanically, electrically, and thermally isolated from the process and the environment, shall include an integral temperature compensation sensor, and shall provide analog signal to the transmitter's electronics for further processing. Factory set correction coefficients shall be stored in the sensor's non-volatile memory for correction and linearization of the sensor output in the electronics section. The factory characterization of the measuring cell shall be specifically configured for differential pressure producing primary elements. The electronics section shall correct the digital signal from the sensor and convert it into a 4-20 mA analog signal for transmission to receiving devices. The electronics section shall contain configuration parameters and diagnostic data in non-volatile EEPROM memory and shall be capable of communicating, via a digital signal superimposed on the 4-20 mA output signal, with a remote interface device. Output signal damping shall be provided, with an adjustable time constant of 0-36 seconds. Total Long Term Stability (Frequency of Calibration) shall be no less than 0.20% of URL for 10 years for +/- 50 degree F. Manufacturer’s warranty is 12 years from date of shipment.

C. The electronics sections of pressure transmitters shall contain user-selectable square root extractors to provide a linear 4-20 mA DC output proportional to flow, when activated. Square root extractor circuitry shall be activated on the flow transmitters listed in the Valve and Control Schedules.

D. If required by the instrument list the transmitter shall be provided with optional diagnostics capable detecting abnormal flow situations and provide a visual alert in addition to a HART alert.

E. Pressure indicating transmitters shall be Model 3051TG2A2B21J as manufactured by Rosemount, or equal.

PART 3 -- EXECUTION

3.01 REQUIREMENTS

A. Refer to the Specifications.

END OF SECTION

SECTION 15215
PROCESS - UV DISINFECTION SYSTEM

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The UV System Supplier shall furnish a complete closed vessel medium pressure, high intensity ultraviolet (UV) light system for disinfection of potable water.

B. The unit(s) shall be furnished and installed with all necessary equipment including the UV reactor, UV duty sensors, UV reference sensor, the UV lamp assemblies, power distribution centers, system instrumentation and controls, automatic quartz sleeve cleaning system, ballast cooling system, and any other auxiliaries.

C. The UV Disinfection System shall be capable of providing disinfection to meet the water quality standards listed in Section 1.02.

1.02 DESIGN CRITERIA

A. The UV System Supplier (UVSS) shall provide a guarantee that the installed system shall continuously meet the specified performance requirements under the following conditions:

1.	Design Flow rate (mgd)	9.0
2.	Average Flow rate (mgd)	3.6
3.	Minimum Flow Rate (mgd)	0.4
4.	Design UV Transmittance at 254nm	>85%
5.	Average UV Transmittance at 254nm	95%
6.	Total Suspended Solids (mg/L)	<5
7.	Total Hardness (mg CaCO3/L)	<5
8.	Total Iron (mg/L)	<5
9.	Turbidity (NTU)	<0.5
10.	Maximum Temperature (oF/ oC)	104/40
11.	Minimum Temperature (oF/ oC)	32/0
12.	Maximum Inlet Pressure (psig)	110
13.	Minimum Hydrotest Pressure (psig)	225
14.	Maximum Pressure Drop (inches W.C. @ x mgd)	4 @ 6,250
15.	Log Cryptosporidium Inactivation	3
16.	Log Giardia Inactivation	3
17.	Surrogate	T1,T7 or MS-2

B. The UV Disinfection System shall consist of two (2) complete, independent UV Systems, including one (1) redundant system as a standby / backup unit.

C. The UV System shall be designed to provide adequate treatment throughout the guaranteed life of the lamps and sleeves. The end of a lamp's useful life shall be defined as the point when the lamp output has decreased to 90 % of its initial output (after 100 hours of burn-in). An additional 10% allowance shall be added for quartz sleeve fouling, yielding a total end of life design factor of 81%.

1.03 QUALIFICATIONS

A. UVSS shall have a minimum of ten (10) years experience in the design and manufacture of UV disinfection equipment. Qualified suppliers shall have a minimum of five (5) full-scale installations of UV Disinfection Systems for the treatment of potable water.

B. Only systems which have undergone independent third-party validation according to the US EPA Disinfection Guidance Manual 2006 are deemed acceptable.

C. The UV Disinfection System shall be the Sentinel® UV Disinfection System as manufactured by Calgon Carbon Corporation of Pittsburgh, PA or equal.

1.04 REFERENCES

REFERENCES	TITLE
NSF 61	NATIONAL SANITATION FOUNDATION
NEMA	NATIONAL ELECTRICAL MANUFACTURER'S ASSOCIATION
NEC	NATIONAL ELECTRIC CODE
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
DVGW 294	GERMAN STANDARD - ARBEITSBLATT W 294: UV – DESINFEKRIONSANLAGEN FUR DIE TRINKWASSSERVERSORGUNG – ANFORDERUNGEN UND PRUFUNG.
IEEE 519	INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC., RECOMMENDED PRACTICES AND REQUIREMENTS FOR HARMONIC CONTROL IN ELECTRICAL POWER SYSTEMS
ASME	PRESSURE VESSELS, SECTION VIII, DIVISION 1 PIPE FLANGES AND FLANGED FITTINGS, B16.5 LARGE DIAMETER STEEL FLANGES: NPS 26 THROUGH NPS 60, B16.47
SSPC	STEEL STRUCTURES PAINTING COUNCIL
UL 508A	UNDERWRITER LABORATORY APPROVAL FOR "ENCLOSED INDUSTRIAL CONTROL PANELS" IN NON-HAZARDOUS AREAS
UVDGM	US EPA UV DISINFECTION GUIDANCE MANUAL (DRAFT, JUNE 2003)
US EPA	UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
CSA	CANADIAN STANDARDS ASSOCIATION

1.05 SUBMITTALS

A. UVSS bid package shall include the following information to facilitate the evaluation and comparison of equipment offered.
   1. Detailed description of any exceptions taken to the specifications.
   2. Complete description of equipment in sufficient detail to verify compliance with these specifications.
   3. Dimensions, weights, critical clearances and installation requirements including extent of any field assembly of subcomponents.
   4. Summary report of third party validation in accordance with the UVDGM.
   5. The UVSS must state the total connected load power requirement of the proposed system.
   6. UVSS must state maximum line distance allowed between UV disinfection reactor and power supply and/or control module.
   7. Minimum cooling water flow requirements.
   8. Describe method of automatic quartz sleeve cleaning provided, including frequency and time required for maintenance.
   9. Identify frequency, duration and type of maintenance procedures that require the reactor to be taken out of service.
   10. Recommended spare parts for one year including pricing.
   11. List of available options and accessories with associated prices.
   12. Reference list detailing at least five similar installations for disinfection of potable water.

13. Provide guaranteed power consumption at average flow and %T conditions using the average end of lamp life/fouling factor. The power consumption shall be the product of the measured power consumption per lamp (including ballast losses) and the total number of the operating lamps plus any power requirements of accessory equipment including, but not limited to, cooling fans, cleaning system, etc.

B. The successful bidder shall submit shop and installation drawings of all materials and equipment furnished under this specification for approval four (4) to six (6) weeks after notice to proceed. Submittals shall include, but not be limited to, the following:
   1. All interconnections and interface requirements, dimensions, weights, and locations of all major elements of the UV System including critical clearance requirements.
   2. Basis of design, including background data, calculations, operational plant data and other information showing the development of the proposed design and that it will conform to the requirements of Paragraph 1.02 A.
   3. Full validation report in accordance with the UVDGM.

C. Complete Operation and Maintenance Manuals shall be submitted at time of delivery. The manuals shall recognize that UV Disinfection technology is not common knowledge to most plant operators, so the manuals shall be thorough and instructive to such personnel.

1.06 DELIVERY

A. Equipment shall be available for delivery within sixteen (16) to eighteen (18) weeks after receipt of approved drawings (ARAD).

B. Equipment must be protected from exposure to elements and stored in weather tight enclosures. Box, crate, or otherwise enclose completely and protect equipment during shipment, handling, and storage. For equipment that shall be stored for greater than two months prior to installation and operation, equipment must be maintained in accordance with manufacturer's long-term storage instructions.

C. Package all spare parts or spare part assemblies in separate, sturdy, waterproof containers clearly marked with the name of the part or assembly, and the name of the unit of which it is a component.

1.07 WARRANTY

A. The UVSS shall warrant the equipment for a period of twelve (12) months from the startup or eighteen (18) months from delivery, whichever comes first.

B. The UVSS shall replace or repair non-consumable parts of the UV system proved to be defective in material or workmanship.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. The UV system shall consist of medium pressure mercury vapor UV lamps, oriented horizontally and perpendicular to flow, installed inside enclosed reactor(s).

B. All equipment shall be new and unused, except for final check-out testing.

2.02 UV DISINFECTION REACTOR

A. The proposed reactor's validation shall have been performed with upstream and downstream straight pipe lengths less than or equal to those that will exist when the reactor is incorporated into the attached layout.

B. The reactor body shall be type 316L stainless steel.

C. All wetted parts on the UV system must meet NSF 61 standards for potable service.

D. All materials exposed to UV light shall be unaffected by prolonged exposure to same.

E. The reactor shall be provided with inlet and outlet flange connections.

F. Reactors weighing greater than 500 pounds shall be provided with lifting lugs.

G. The reactor shall be designed for a maximum operating pressure of 150 psig.

H. The reactor shall be abrasive beadblasted on all exterior and interior surfaces. All weld discolorization to be removed.

I. The reactor shall be designed in such a way that when installed and operated according to manufacturer's instructions, there is no possibility of direct operator exposure to UV light from the lamps.

J. The reactor shall include an overtemperature sensor / interlock.

K. The reactor shall include at least one manual drain plug.

L. The reactor shall incorporate a means to detect a failure in the quartz sleeve seal.

2.03 LAMPS

A. The UV lamps shall be medium pressure mercury arc discharge type.

B. Changing of lamps shall be easily performed by operating personnel at the plant. Systems whereby the lamp assemblies have to be returned to the factory for lamp replacement will not be acceptable.

C. All wire lengths to be used to connect the lamps to the power distribution module shall be enclosed inside a module or junction box and not exposed to the water. Field wiring between this junction box and the power distribution module terminal block shall be by the installation Contractor.

D. Lamps shall be guaranteed to provide 90% of initial output after 5000 hours of operation. with a maximum of 600 starts. Lamps failing to meet this criteria shall be replaced on a pro rata basis after 500 hours of operation.

E. Ten (10) spare lamps shall be provided. Spare lamps will be packaged to protect them from breakage and, in the event that any single lamp is broken, any mercury release from the lamp will be contained.

2.04 QUARTZ SLEEVES

A. The quartz sleeves shall be type 214A clear fused quartz circular tubing or approved equal.

2.05 UV SENSORS

A. The sensors provided with the UV System shall provide continuous performance verification over the water transmission, lamp life and quartz sleeve fouling, as specified in paragraph 1.02 A.

B. The supplied UV sensors shall be certified in accordance with DVGW 294.

C. One UV sensor shall be supplied for each lamp.

D. The sensors shall be comprised of a stainless steel probe body, SiC – sensor with UV-C-filter, Type UVC 3, and window.

E. The sensor spectral response shall be in the 210 – 275 nm range.

F. The sensors shall be unaffected by static, electromagnetic fields, or shortwave radio emissions.

G. The sensors shall be removable from the irradiation chamber without draining the unit or removing the probe well.

H. A DVGW certified reference sensor shall be provided to obtain UV sensor reference readings.

I. The system shall incorporate a method to perform checks and rescaling of UV sensors without requiring the reactor to be taken offline or decreasing the treatment capacity.

J. The UVSS shall provide a guarantee for the long term variablity of the sensor, not to exceed 1.0% per year.

2.06 CLEANING SYSTEM

A. An automatic quartz sleeve cleaning system shall be provided.
   1. An automatic and integral mechanical quartz sleeve cleaning system shall be supplied as part of the UV System. The cleaning system shall use mechanical wiping, using a stainless steel brush, to de-scale the quartz sleeves.

2. The mechancial cleaning system shall be driven by electric motor(s).
3. The cleaning system shall be fully operational without requiring lamps to be placed out of service.
4. Operation of the cleaning mechanism must not reduce the effectiveness of the treatment.
5. The cleaning cycle shall be field adjustable within the range of once every few minutes to once per month.
6. Position feedback devices shall provide indication of full mechanical travel in each direction for each cleaning cycle.

2.07 ELECTRICAL

The electrical system components for each reactor shall be contained within cabinet(s) housing both the ballast power supply and controls system. All wiring between these two components shall be factory supplied and pre-wired prior to shipment.

A. Power Distribution/Ballast Power Supply
1. Electrical supply to the Control System/Ballast Power Supply shall be 480 VAC, 3 phase, 3 wire, 60 hertz.
2. The Control System/Ballast Power Supply cabinet shall be internally fused. All control power shall be internally derived from main feeder.
3. The Control System /Ballast Power Supply cabinet shall be NEMA 12 stainless steel with adequate cooling.
4. The Control System /Ballast Power Supply cabinet shall be provided with all required cooling fans, thermal protection, and door access interlocks.
5. System power factor shall be minimum 0.92 at full power.
6. Ballasts shall be of electromagnetic design specifically designed for operation of medium pressure high intensity lamps. Ballast power shall be infinitely variable down to at least 40% of lamp full power.
7. Ballasts shall tolerate supply voltage fluctuations of +10% / -40% without extinguishing the lamps.
8. Ballast electrical efficiency shall be a minimum 92% at full power.
9. Ground fault detection shall be provided for each lamp circuit.
10. System shall meet the harmonic distortion requirments of IEEE 519, Tables, 10.1 10.2., and 10.3.

B. PLC Control System
1. Each reactor shall be capable of completely independent operation from other systems.
2. Each reactor’s control system shall incorporate an Emergency stop button as a hardwired interlock independent of PLC control.
3. Each reactor shall be controlled by an Allen Bradley programmable logic controller (PLC) which has been factory programmed and tested prior to shipment.
4. Each reactor shall include an Allen Bradley Panel Viewcolor touchscreen displaying system status and operational data. The touchscreen interface shall provide access to all operator setup and control functions. The interface shall include provision for testing of all equipment while the system is off-line for maintenance.
5. The PLC control system shall monitor the continuous operation of the following:
   a. Per reactor
      1) Reactor high temperature
      2) Reactor leak
      3) Lamp/electrical compartment door access
      4) Minimum water flow
      5) UV sensor irradiance
      6) Cleaning mechanism status and position
      7) Cleaning cycle counts
   b. Per lamp circuit
      1) Lamp current
      2) Ballast overtemperature

3) Ground fault
4) Individual lamp run hours – both resettable and non-resettable
5) Individual lamp starts – both resettable and non-resettable

c. Per Power Supply cabinet
1) Cabinet overtemperature
2) Electrical compartment door access
3) Emergency stop condition
4) Control Power.

6. Power for PLC Control System shall be derived from the Power Distribution/Ballast Power Supply.
7. The PLC Control System shall be provided with a minimum 10% spare I/O of each type.
8. The PLC Control System shall be provided with a minimum 25% spare program memory.
9. The PLC Control System shall be designed and certified in accordance with UL 508A. At a minimum the following interlocks shall be provided to alarm and/or shutdown the UV System:
a. Emergency Stop
b. Low flowrate
c. Reactor high temperature
d. Reactor leak
e. Reactor access cover open
f. Lamp low amps
g. Lamp high amps
h. Lamp ground fault
i. Power Distribution/Ballast Power Supply cabinet door open
j. Power Distribution/Ballast Power Supply high temperature
k. Ballast high temperature
l. Low UV Dose

2.08 INSTRUMENTATION AND CONTROL

A. Dose Pacing
1. Each reactor shall allow the operator to enter the desired dose setpoint through the touchscreen interface. The reactor shall operate under closed process control to assure the desired dose is being delivered for the water quality conditions and flow rate.
2. The closed loop control shall be the Calculated Dose method as defined in the UVDGM.
3. Dose pacing shall not require the use of a UVT analyzer. A UVT analyzer may be included as optional equipment providing additional process information. If a UVT analyzer is required for dose pacing, it must be included in the supplier's scope of supply.
4. The UV sensors shall be positioned at the optimal distance from the lamp such that dose is proportional to the sensor value, whether changes in the sensor value are brought about by water quality (UVT) or by lamp output (lamp power, lamp age or quartz transmittance/fouling).
5. The system controls shall calculate the required sensor value from the dose set-point and flow through the reactor. The lamp power shall then be automatically adjusted by a control loop in the PLC to achieve at least the minimum desired sensor value by all lamps in the reactor.
6. The system shall automatically determine the number of lamp banks and lamp power to operate. Extra banks of lamps shall be switched on automatically in advance to ensure they are operating when needed.

B. Flow Meters
1. Each reactor's control system shall receive a signal proportional to flow in the reactor. The flowmeter shall be supplied by others. This signal shall be used in determining the required UV irradiance setpoint and lamp power level as described above.

PART 3 -- EXECUTION

3.01 INSTALLATION

A. The equipment furnished by the UVSS shall be installed by the installation Contractor in accordance with the manufacturer's printed instructions.

3.02 MANUFACTURER'S SERVICES

A. The UVSS shall provide the services of a qualified field service representative to perform the following services;
   1. Installation Inspection: The manufacturer shall provide the services of a qualified representative to verify the installation of the UV Disinfection System and associated controls prior to placing the system into service. After satisfactory completion of the inspection, the manufacturer shall certify in writing that the installation is proper and that the equipment is ready to start.
   2. Start up: Following certification that the equipment has been properly installed and is ready to start up; the manufacturer shall supply the services of a qualified representative to start the equipment and ensure its proper operation.
   3. Operator training: On-Site training shall be provided to the Owner's personnel in the operation and maintenance of the equipment.

B. The UVSS shall provide a service representative in accordance with the following table:

SERVICE	NO. OF MAN DAYS
Start up and Installation Inspection	2
Operator Training	1
Total Number of Days	3

END OF SECTION

SECTION 15216
PROCESS - ELECTRONIC CONTROL VALVES

PART 1.0 GENERAL

1.01 SIZE

A. The valve shall be a 16” valve.

1.02 FUNCTION

A. The Electronic Control Valve shall control flow, pressure, tank level or valve position. “Tying” of equipment into packages for the purpose of thwarting competition shall be considered to be in non-compliance with these specifications. Manufacturers shall price items under different subsections or sections separately.

1.03 MAIN VALVE

A. The valve shall be hydraulically operated, single diaphragm-actuated, globe or angle pattern. The valve shall consist of three major components: the body with seat installed, the cover with bearing installed, and the diaphragm assembly. The diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve, separating operating pressure from line pressure. Packing glands and/or stuffing boxes are not permitted and there shall be no pistons operating the main valve or pilot controls.

B. Main Valve Body
   1. No separate chambers shall be allowed between the main valve cover and body. Valve body and cover shall be of cast material. Ductile Iron is standard and other materials shall be available. No fabrication or welding shall be used in the manufacturing process. Total shipping weight shall be equal or greater in all respects to the Hytrol 100-01/100-20 body. The valve shall contain a resilient, synthetic rubber disc with a rectangular cross-section contained on three and one-half sides by a disc retainer and forming a tight seal against a single removable seat insert. No O-ring type discs (circular, square, or quad type) shall be permitted as the seating surface. The disc guide shall be of the contoured type to permit smooth transition of flow and shall hold the disc firmly in place. The disc retainer shall be of a sturdy one-piece design capable of withstanding opening and closing shocks. It must have straight edge sides and a radius at the top edge to prevent excessive diaphragm wear as the diaphragm flexes across this surface. No hour-glass shaped disc retainers shall be permitted and no V-type or slotted type disc guides shall be used.
   2. The diaphragm assembly containing a non-magnetic 303 stainless steel stem; of sufficient diameter to withstand high hydraulic pressures, shall be fully guided at both ends by a bearing in the valve cover and an integral bearing in the valve seat. The seat shall be a solid, one-piece design and shall have a minimum of a five-degree taper on the seating surface for a positive, drip-tight shut off. No center guides shall be permitted. The stem shall be drilled and tapped in the cover end to receive and affix such accessories as may be deemed necessary. The diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve, separating operating pressure from line pressure.
   3. The flexible, non-wicking, FDA approved diaphragm shall consist of nylon fabric bonded with synthetic rubber compatible with the operating fluid. The center hole for the main valve stem must be sealed by the vulcanized process or a rubber grommet sealing the center stem hole from the operating pressure. The diaphragm must withstand a Mullins Burst Test of a minimum of 600 x per layer of nylon fabric and shall be cycle tested 100,000 times to insure longevity. The diaphragm shall not be used as the seating surface. The diaphragm shall be fully supported in the valve body and cover by machined surfaces which support no less than one-half of the total surface area of the diaphragm in either the fully opened or fully closed position.
   4. The main valve seat and the stem bearing in the valve cover shall be removable. The cover bearing and seat in 6” and smaller size valves shall be threaded into the cover and body. The valve seat in 8” and larger size valves shall be retained by flat head machine

screws for ease of maintenance. The lower bearing of the valve stem shall be contained concentrically within the seat and shall be exposed to the flow on all sides to avoid deposits. To insure proper alignment of the valve stem, the valve body and cover shall be machined with a locating lip. No “pinned” covers to the valve body shall be permitted. Cover bearing, disc retainer, and seat shall be made of the same material. All necessary repairs and/or modifications other than replacement of the main valve body shall be possible without removing the valve from the pipeline. Packing glands and/or stuffing boxes shall not be permitted and components including cast material shall be of North American manufacture.

5. The valve manufacturer shall warrant the valve to be free of defects in material and workmanship for a period of three years from date of shipment, provided the valve is installed and used in accordance with all applicable instructions. Electrical components shall have a one-year warranty. The valve manufacturer shall be able to supply a complete line of equipment from 1 1/4” through 24” sizes and a complete selection of complementary equipment. The valve manufacturer shall also provide a computerized cavitation chart which shows flow rate, differential pressure, percentage of valve opening, Cv factor, system velocity, and if there will be cavitation damage.

C. Material Specification

Valve Size: 16 Inch
Main Valve Body and Cover: Ductile Iron
Main Valve Trim: Stainless Steel
End Detail: F
Pressure Rating: 150 Class
Temperature Range: to 180° F
Rubber Material: Buna N
Coating:
Desired Options:

1.04 PILOT CONTROL SYSTEM

A. The 131/631-01 hydraulic control valve pilot system shall consist of dual solenoids which alternately apply or relieve pressure to the diaphragm chamber to position the main valve. They shall be normally closed (energized to open), 120 or 240 volt AC with Nema type 4 enclosure. A manual system to by-pass the solenoids shall also be provided.

1.05 ENVIRONMENTAL PARAMETERS

Temperature: 5 C to 55 C (40 F to 130 F)

Humidity: 90% RH, non-condensing.

Power Input: 13.5 watts max. at 117 VAC, 50/60 Hz.

Memory Protection: 10 yr. type. life lithium battery

Housing: Flame retardant UL rated ABS plastic.

Fits 1/4 DIN cutout.

A direct factory representative shall be made available for start-up service, inspection and necessary adjustments

1.06 MATERIAL SPECIFICATION FOR PILOT CONTROL:

Pressure Rating: 200 psi

Trim: Stainless Steel

Rubber Material: Buna-N

Tubing and Fittings: Stainless Steel

Adjustment Range: N/A

Operating Fluids: Water

Voltage: 24 VDC

Enclosure Type: NEMA-4

1.07 MANUFACTURER

A. This valve shall be a Cla-Val Co. Model No. 631G-36BCSY Electronic Control Valve as manufactured by Cla-Val Co., Newport Beach, CA 92659-0325.®™

END OF SECTION

SECTION 15250

MECHANICAL INSULATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Piping Insulation.

B. Equipment Insulation.

C. Ductwork Insulation.

D. Jackets and Accessories.

1.02 RELATED WORK

A. Section 15050 - Basic Mechanical Materials and Methods.

1.03 REFERENCES

A. ANSI/ASTM C195 - Mineral Fiber Thermal Insulation Cement.

B. ANSI/ASTM C533 - Calcium Silicate Block and Pipe Thermal Insulation.

C. ANSI/ASTM C547 - Mineral Fiber Preformed Pipe Insulation.

D. ANSI/ASTM C612 - Mineral Fiber Block and Board Thermal Insulation.

E. ASTM B209 - Aluminum and Aluminum-alloy Sheet and Plate.

F. ASTM C449 - Mineral Fiber Hydraulic-setting Thermal Insulating and Finishing Cement.

G. UL 723 - Surface Burning Characteristics of Building Materials.

1.04 QUALITY ASSURANCE

A. Applicator: Company specializing in piping insulation application with three years minimum experience.

B. Materials: Flame spread/smoke developed rating of 25/50 in accordance with UL 723.

1.05 SUBMITTALS

A. Submit product data under provisions of Division 1.

B. Include product description, thickness for each service, and locations.

C. Submit manufacturer's installation instructions.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesive, mastics, and insulation cements.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Johns-Manville.

B. Certain-Teed.

C. Armstrong.

D. IMCOA.

E. Rubatex.

F. Substitutions: Under provisions of Division 1.

2.02 INSULATION - PIPING

A. Type A: Glass fiber, rigid, molded, non-combustible insulation; ANSI/ASTM C547; 'k' value of 0.24 at 75º F, rated to 850º F, vapor retarder jacket of Kraft paper bonded to aluminum foil; Johns-Manville "Micro-Lok" or equal.

B. Type B: Cellular foam, preformed for P-trap and hot water angle stop and supply tube at handicap sinks and lavatories. As manufactured by TCI Products.

2.03 FIELD APPLIED JACKET

A. Vapor Barrier Jackets: Kraft reinforced foil vapor barrier with self-sealing adhesive joints.

B. PVC Jackets: One piece, pre-molded type, Johns-Manville Zeston 2000, fitting covers and jacketing material.

2.04 INSULATION - DUCTWORK

A. Type C: Exterior FSK Duct Wrap: Flexible glass fiber; ANSI/ASTM C553; commercial grade; 'k' value of 0.27 at 75º F; rigid fiber board; ANSI/ASTM C612, ‘k’ value of 0.24 at 75° F, 3.0 lb./cu. ft. density. 0.00035 inch foil scrim facing. Minimum thermal performance shall be R=4.8. Johns-Manville “Microlite Duct Wrap” and Certainteed “IB board” or equal.

2.05 INSULATION ACCESSORIES

A. Adhesives: Waterproof and fire-retardant type.

B. Indoor Jacket: 6 oz./sq. yd. canvas or presized glass cloth, minimum 7.8 oz./sq. yd.

C. Outdoor Jacket: Coated glass fiber sheet, 30 lb/sq. yd.

D. Lagging Adhesive: Fire resistive to NFPA 255.

E. Impale Anchors: Galvanized steel, 12 gauge, self-adhesive pad.

F. Joint Tape: Glass fiber cloth, open mesh.

G. Tie Wire: Annealed steel, 16 gauge.

PART 3 EXECUTION

3.01 PREPARATION

A. Install materials after piping and ductwork has been tested and approved.

B. Clean surfaces for adhesives.

C. Prepare surfaces in accordance with manufacturer's recommendations.

3.02 INSTALLATION - PIPING

A. Install materials in accordance with manufacturer's recommendations, building codes and industry standards.

B. Continue insulation vapor barrier through penetrations except where prohibited by code.

C. Locate insulation and cover seams in least visible locations.

D. Neatly finish insulation at supports, protrusions, and interruptions.

E. Provide insulated cold pipes conveying fluids below ambient temperature with vapor retardant jackets with self sealing laps. Insulate complete system.

F. For insulated pipes conveying fluids above ambient temperature, secure jackets with self sealing lap or outward clinched, expanded staples. Bevel and seal ends of insulation at equipment, flanges, and unions.

G. Provide insert between support shield and piping on piping 1-½" inches diameter or larger. Fabricate of Johns-Manville Thermo-12 or other heavy density insulating material suitable for temperature. Insulation inserts shall not be less than the following lengths:

1-½" to 2-½" pipe size	10" long
3" to 6" pipe size	12" long
8" to 10" pipe size	16" long
12" and over	22" long

H. For pipe exposed in the Boiler Room, Process Bay and Chlorine room or in finished spaces below 10 feet above finished floor, finish with Johns-Manville Zeston 2000 PVC jacket and fitting covers.

I. For exterior applications, provide weather protection jacket or coating. Insulated pipe, fittings, joints, and valves shall be covered with Johns-Manville Zeston 2000 PVC or metal jacket. Jacket seams shall be located on bottom side of horizontal piping.

3.03 SCHEDULE - PIPING

PIPING	TYPE	PIPE SIZE Inch	MINIMUM INSULATION THICKNESS Inch
Domestic Cold Water	A	All Sizes	1”
Domestic Hot Water Supply - Mains	A	All Sizes	1”
Domestic Hot Water Supply - Branch-lines	A	All Sizes	½"
Domestic Hot Water Recirculating	A	All Sizes	1”
Heating Glycol/Water Supply and Re-turn	A	All Sizes	1"
Vent Through Roof	A	All Sizes	1"
Handicap lavatories, sinks @ waste and supply	B	All Sizes	½"

3.04 INSULATION - DUCTWORK

A. Install materials in accordance with manufacturer's instructions.

B. Provide insulation with vapor barrier when air conveyed may be below ambient temperature. Continue insulation with vapor barrier through penetration.

C. Exterior Insulation (Type C) Application:
1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
2. Secure insulation without vapor barrier with staples, tape, or wires.
3. Install without sag on underside of ductwork. Use [adhesive] [or] [welded] mechanical fasteners to prevent sagging. Secure insulation with mechanical fasteners on 15 inch

centers maximum, on bottom and side of ductwork with dimension exceeding 20 inches. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

4. Maximum 25% compression.

D. Where canvas jacketing is indicated, apply mastic in sufficient thickness to completely cover the texture of the canvas material.

3.05 SCHEDULE - DUCTWORK

DUCTWORK	TYPE	INSULATION THICKNESS Inch	FINISH
Combustion Air Duct	C	2" Rigid	CANVAS
Exhaust & Relief Ducts Within 10 ft. of Exterior Openings	C	1" Rigid	CANVAS
Outside Air Intake Ducts	C	2" Rigid	CANVAS
Supply Ducts	C	1"	FSK

END OF SECTION

SECTION 15260
PROCESS - PIPING SPECIALTIES

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:
   1. American Society of Mechanical Engineers (ASME):
      a. B16.1, Gray Iron Pipe Flanges and Flanged Fittings.
      b. B16.5, Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24.
   2. American Water Works Association (AWWA):
      a. C153/A21.53, Ductile-Iron Compact Fittings for Water Service.
      b. C210, Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines.
      c. C213, Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines.
      d. C219, Bolted, Sleeve-Type Couplings for Plain-End Pipe.
   3. Manual M11, Steel Pipe - A Guide for Design and Installation.
   4. ASTM International (ASTM):
      a. A153/A153M, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
      b. A276, Standard Specification for Stainless Steel Bars and Shapes.
   5. National Fire Protection Association (NFPA): 24, Standard for the Installation of Private Fire Service Mains and Their Appurtenances.
   6. NSF International (NSF): NSF 61, Drinking Water System Components-Health Effects.

1.02 SUBMITTALS

A. Action Submittals:
   1. Manufacturer's data on materials, construction, end connections, ratings, overall lengths, and live lengths (as applicable).

B. Chemical Injectors:
   1. Type, size, quantity, materials, and model number of each chemical injector system.
   2. Sketch of each chemical injector system showing major parts, main pipe and dimensions.
   3. Details and model number of each support system and component.
   4. Details and model of connectors; e.g., service saddle.

PART 2 PRODUCTS

2.01 GENERAL

A. Provide required piping specialty items, whether shown or not shown on Drawings, as required by applicable codes and standard industry practice.

B. Rubber ring joints, mechanical joints, flexible couplings, and proprietary restrained ductile iron pipe joints are considered flexible joints; welded, screwed, and flanged pipe joints are not considered flexible.

C. All process instruments and monitoring equipment shall be installed in such a manner that allows for removal of individual components for maintenance and troubleshooting without affecting other portions of the process. Drawings are best representation of the proposed design, omission of isolation valves for instruments on the process piping diagram does not superseded this requirement.

2.02 COUPLINGS

A. General:
   1. Coupling linings for use in potable water systems shall be in conformance with NSF 61.
   2. Couplings shall be rated for working pressure not less than indicated in Piping Schedule for the service and not less than 150 psi.

3. Couplings shall be lined and coated with fusion-bonded epoxy in accordance with AWWA C213.
4. Unless thrust restraint is provided by other means, couplings shall be harnessed in accordance with requirements of AWWA Manual M11, and restrained with retainer bar or ring welded to pipe end, or as shown on Drawings.
5. Sleeve type couplings shall conform to AWWA C219 and shall be hydraulically expanded beyond minimum yield for accurate sizing and proofing of tensile strength.

B. Dismantling Joints:
1. Pressure Rating:
a. Minimum working pressure rating shall not be less than rating of the connecting flange.
b. Proof testing shall conform to requirements of AWWA C219 for bolted couplings.

C. Manufacturers and Products:
1. Dresser Piping Specialties; Style 131.
2. Viking Johnson.

2.03 SERVICE SADDLES

A. Double-Strap Iron:
1. Pressure Rating: Capable of withstanding 150 psi internal pressure without leakage or over stressing.
2. Run Diameter: Compatible with outside diameter of pipe on which saddle is installed.
3. Taps: Iron pipe threads.
4. Materials:
a. Body: Malleable or ductile iron.
b. Straps: Stainless steel.
c. Hex Nuts and Washers: Stainless steel.
d. Seal: Rubber.
5. Manufacturers and Products:
a. Smith-Blair; Series 313 or 366.
b. Dresser; Style 91.

2.04 PIPE SLEEVES

A. Steel Pipe Sleeve:
1. Minimum Thickness: 3/16 inch.
2. Seep Ring:
a. Center steel flange for water stoppage on sleeves in exterior or water-bearing walls, 3/16-inch minimum thickness.
b. Outside Diameter: Unless otherwise shown, 3 inches greater than pipe sleeve outside diameter.
c. Continuously fillet weld on each side all around.
3. Factory Finish:
a. Galvanizing:
1) Hot-dip applied, meeting requirements of ASTM A153/A153M.
2) Electroplated zinc or cadmium plating is unacceptable.
b. Shop Lining and Coating: Factory prepare, prime, and finish coat in accordance with Section 09900, Painting and Coating.

B. Modular Mechanical Seal:
1. Type: Interconnected synthetic rubber links shaped and sized to continuously fill annular space between pipe and wall sleeve opening.
2. Fabrication:
a. Assemble interconnected rubber links with ASTM A276, Type 316 stainless steel bolts and nuts.
b. Pressure plates shall be reinforced nylon polymer.

3. Size: According to manufacturer's instructions for size of pipes shown to provide a watertight seal between pipe and wall sleeve opening.
4. Manufacturer: Thunderline Corp., Link-Seal Division.

2.05 CHEMICAL INJECTOR SYSTEM

A. Chemical Injectors:
1. Type, size, quantity and materials as shown on the Drawings and Standard Details.
2. Manufacturer: CHLORINATORS INCORPORATED.

B. Connectors to Main Pipe: Double-strap iron service saddle, as shown and specified.

2.06 MISCELLANEOUS SPECIALTIES

A. Strainers, Water Service, 1/2 Inch:
1. Type: In-line strainer. Maximum pressure 50 psi at 70º F, 100 psi at 125º F.
2. Top: White 6/6 nylon material, 1/2-inch Female NPT.
3. Bowl: Transparent, lear nylon.
4. Screen: Heavy-gauge Type 304 stainless steel, 40-mesh.
5. Manufacturers and Products: Ron-Vik Inc. Part No. 12582; Distributor: VacMotion.

PART 3 EXECUTION

3.01 GENERAL

A. Provide accessibility to piping specialties for control and maintenance.

3.02 SERVICE SADDLES

A. Ferrous Metal Piping (except stainless steel): Double-strap iron.

B. Plastic Piping: Nylon-coated iron.

3.03 COUPLINGS

A. General:
1. Install in accordance with manufacturer's written instructions.
2. Before coupling, clean pipe holdback area of oil, scale, rust, and dirt.
3. Do not remove pipe coating. If damaged, repair before joint is made.
4. Application:
a. Metallic Piping Systems: Flexible couplings and flanged coupling
1) As specified in Section 15200, Process Piping-General.
2) Above Grade in Nonsubmerged Areas: Hot-dip galvanized after fabrication.
3) Below Grade or in Submerged or Damp Environments: Shop-lined and

B. Installation:
1. Support noninsulating type securely in formwork to prevent contact with reinforcing steel and tie-wires.
2. Caulk joint with specified sealant in non-submerged applications and seal below grade and submerged applications with wall penetration seal adapters.

END OF SECTION

SECTION 15261

PROCESS - PVDF (KYNAR) PIPING

PART 1 GENERAL

1.01 REFERENCES

A. The following standards apply to products used within this section.
   1. ASTM D 1598 Standard Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure
   2. ASTM D 1559 Test Method for Resistance of Plastic Flow of Bituminous Mixtures Using Marshall Apparatus
   3. ASTM D 2122 Dimensions of Pipe.
   4. ASTM D 2837-85 Obtaining Hydro Static Design Basis for Thermoplastic Pipe Materials
   5. ASTM D 2637 Specification for Hexylacetate
   6. ASTM D 3222-81 Standard Specification for Unmodified Poly(Vinylidene Fluoride) (PVDF) Molding Extrusion and Coating Materials

B. The system design shall meet the requirements of ASME/ANSI B31.3 for design criteria where temperature and pressure fall within the limits of the code.

1.02 DEFINITIONS

A. PVDF - Polyvinylidene Fluoride

1.03 SYSTEM DESCRIPTION

A. System shall be a PVDF system of uniform pipe and fitting materials. System pressure ratings shall be based on continuous use of 50 years.

1.04 SYSTEM PERFORMANCE REQUIREMENTS

A. System performance requirements shall handle the following:
   1. Operating Pressure
   2. Operating Temperature
   3. Text Pressure
   4. Media: Deionized Water
   5. All PVDF systems shall be designed taking into consideration the above parameters, end loads, thermal
   6. expansion and proper burial and/or hanging methods.

1.05 SUBMITTALS

Submit the Following:

A. Product data for the system specified; relative to materials, dimensions of individual components, profiles and finishes.

B. Product certificates signed by manufacturer of PVDF piping product stating compliance to stated requirements.

C. Welder certificates, certifying that welders comply with the installation procedures as outlined by ASTM D-2657. All training should be scheduled and completed prior to job start-up.

D. Qualification of firms supplying PVDF. Firms must have a minimum of five years experience in design, installation and operation of thermoplastic high-purity piping systems.

1.06 QUALITY ASSURANCE

A. Obtain components from a single source having responsibility and accountability to answer and resolve problems regarding proper installation, compatibility, performance, and acceptance.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver all PVDF pipe to arrive on-site wrapped or protected to prevent damage in shipping.

B. Deliver all PVDF fittings to arrive on-site in boxes.

C. Store products on elevated platforms in a dry location with protection from the environment.

D. Lift, support and transport PVDF piping per manufacturers' recommendations.

1.08 WARRANTY

A. Warranty period is one year after date of substantial completion.

1.09 EXTRA MATERIAL

A. Turn over to owner at end of construction, necessary welding equipment as suggested by manufacturer for repair, additions and maintenance of PVDF piping system.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements products which may be incorporated in the work include: PVDF by Chemline Plastics Limited, Thornhill, Ontario, Canada, (905) 889-7890; or by Miller Plastics, Burgettstown, PA, (724) 947-5000.

2.02 MATERIAL

A. General
   1. Pipe, valves and fittings shall be made from virgin resin produced by one supplier. The resin shall meet or exceed the requirements outlined for a Type II suspension grade homopolymer resin in ASTM D-3222.
   2. Manufacturer shall test all lots to ensure the melt flow index is within allowable range.

B. Chemical Resistance and application of PVDF to be verified and approved by manufacturer.

C. Engineering and Design criteria should be per Manufacturer's printed literature.

2.03 SYSTEM COMPONENTS

A. Pipe
   1. All piping will be schedule 80 with fusion joints.

B. Fittings
   1. All fittings through 12" shall be injected molded. Fittings shall have same wall thickness and pressure ratings as the pipe.

C. Packaging
   1. All fittings are to be packaged in a single PE bag or boxed depending on size. All fittings are shipped in boxes.

D. Valves
   1. All valves shall be produced in the same manner as the fittings.
   2. Spigot Diaphragm Valves:
   3. 1/2"-2" shall be of a PVDF body and a PTFE diaphragm. Valves will be of spigot single body design.
   4. True Union Diaphragm Valves:
   5. 1/2-2" shall be constructed of PVDF resin. The valves are to be by Chemline Plastics. The diaphragm is Teflon with a PVDF gas barrier. End connectors are for butt fusion style and gaskets are Viton.
   6. Butterfly Valves:
      a. All sizes 1-1/2"-12" shall be a class 150 lug style PVC or PVDF body. Seat liner and seals shall be Viton or platinum chloride cured silicone. Disc shall be PVDF as outlined above.
   7. Reduced Dead leg Valve:
      a. All reduced dead leg valves shall be made of PVDF Solef resin. Valve bodies are to be unibody, molded design with a full 150 psi rating. All valves shall be T-Diaphragm valves by Agru.
   8. Check Valves:
      a. All sizes class 150, ball type PVDF body with Viton seat and seals. 230 PSI at 73.4°F for sizes 1/2" through 2-1/2" nominal 150 PSI at 73.4°F for sizes above 2-1/2" nominal.

2.04 PRESSURE RATING

A. Pipe and fittings shall be 230 psi rated from ½" to 2 ½". Sizes 3" – 12" shall be 150 psi rated. High temp or pressure systems shall be 230 psi rated in all sizes. 150 and 230 psi ratings are at 68 F. Consult manufacturer for pressure deratings higher temperatures.

2.05 PRESSURE RATING--VALVES

A. Pressure rating of valves shall be per manufacturer's recommendations based on materials, valve type and size.

2.06 SPECIALTY FITTINGS

A. Specialty fittings are to include restraint fittings, instrumentation fittings, instrumentation donuts, etc. Specialty fittings shall be machined and are molded of the same PVDF resin as the pipe.

2.07 JOINING EQUIPMENT

A. A. Installers shall be pre-qualified through training on welding technique according to ASTM D-2657.

B. C. Joining Equipment shall be either butt-fusion or socket fusion method.

C. All flange and fitting bolts and hardware shall be 316 stainless steel.

PART 3 INSTALLATION

3.01 TESTING

A. Prior to pressure testing, the system shall be examined for the following items:
   1. Pipe shall be completed per drawing layout with all pipe and valve supports in place.
   2. Pipe, valves and equipment shall be supported as specified, without any concentrated loads on the system.
   3. Pipe shall be in good condition, void of any cracks, gouges or deformation.
      a. Pipe flanges shall be properly aligned. All flange bolts should be checked for correct torque.
      b. All joints should be reviewed for appropriate welding technique.
      c. Socket--to have two beads on the end of the fitting and on the outside of the pipe in contact. Joints should have two beads 360° around the joint.

B. If any deficiencies appear, the quality control manager shall provide directions for repair.

C. Pressure Test
   1. Test fluid should be deionized water with quality level set by Owner's Representative. In all cases test must be done hydrostatically. Air is not acceptable.
   2. Filling the system--Open all valves and vents to purge the system of air. Slowly inject the water into the system, making sure that air does not become trapped in the system.
   3. Begin pressurizing the system in increments of 10 PSI. Bring the system up to 250 PSI and hold. Allow the system to hold pressure for a minimum of two hours and up to a recommended 12 hours. Check pressure gauge after one hour. Due to natural creep effects on plastic piping the pressure will have decreased. If drop is less than 10% pump the pressure back up. At this time the system may be fully pressurized to desired test pressure.
   4. If after one hour the pressure has decreased more than 10%, consider the test a failure. Note the 10% value may need to be greater for larger systems, or systems experiencing significant thermal changes.
   5. Test is to be witnessed by Owner's Representative and certified by the contractor.
   6. In obvious leaks can be found by emptying the system and placing a 10 psi charge of clean, dry nitrogen on the system. Each joint should then be individually checked using a soapy water solution or an Ultrasonic leak detection gun. Leak detection guns should be available from the pipe manufacturer.

3.02 HANGING

A. Pipe shall be hung in accordance with manufacturers' recommendations to avoid damage to the pipe.

B. Proper support spacing is required in order to avoid sagging of the material. Support spacing is temperature dependent and shall be based on manufacturer

END OF SECTION

SECTION 15262
PROCESS - AIR RELEASE VALVES

PART 1 - GENERAL

1.01 SCOPE

A. This specification is intended to cover the design, manufacture, and testing of 1/2 in. (13 mm) through 6 in. (150 mm)
   1. Air Release Valves suitable for clean or raw water service with pressures up to 740 psig (5100 kPa).

B. Air Release Valves shall be automatic float operated valves designed to release accumulated air from a piping system while the system is in operation and under pressure. The capacity and pressure rating of the valve is dependent on the diameter of the precision orifice in the cover. A large inlet connection is required for proper air and water exchange. [NOTE:See Air/Vacuum Valves for exhausting and admitting large volumes of air and Combination Air Valves for both air release and air/vacuum functions.].

1.02 STANDARDS, APPROVALS AND VERIFICATION

A. Valves shall be manufactured and tested in accordance with American Water Works Association (AWWA) Standard C512.

B. Valves used in potable water service shall be certified to NSF/ANSI 61 Drinking Water System Components – Health Effects.

C. Manufacturer shall have a quality management system that is certified to ISO 9001 by an accredited, certifying body.

D. Models 15A and 22 shall be Factory Mutual Approved and Underwriters Laboratories Listed for fire protection.

1.03 CONNECTIONS

A. Valves 3 in. (76mm) and smaller shall be threaded with NPT inlets and outlets. The body inlet connection shall be hexagonal for a wrench connection. Larger valves shall have ANSI Class 125 flanged inlets.

B. The valve shall have two additional NPT connections for the addition of gauges, testing, and draining.

1.04 DESIGN

A. The cover shall be bolted to the valve body and sealed with a flat gasket. Resilient seats shall be replaceable and provide drop tight shut off to the full valve pressure rating.

B. Floats shall be unconditionally guaranteed against failure including pressure surges. Mechanical linkage shall provide sufficient mechanical advantage so that the valve will open under full operating pressure. Simple lever designs shall consist of a single pivot arm and a resilient orifice button. Compound lever designs shall consist of two levers and an adjustable threaded resilient orifice button.

PART 2 - PRODUCTS

2.01 MATERIALS

A. The valve body and cover shall be constructed of ASTM A351 grade cf8m stainless steel for working pressures up to 300 psig.

B. The orifice, float and linkage mechanism shall be constructed of type 316 stainless steel. Non-metallic floats or linkage mechanisms are not acceptable. The orifice button shall be Viton for simple lever valves and Buna-N for compound lever designs.

2.02 OPTIONS

A. An optional vacuum check on the outlet shall be provided to prevent air from re-entering the system during negative pressure conditions.

PART 3 - INSTALLATION

3.01 CROSS CONTAMINATION AND SECURITY PROTECTION

A. All Air (Release, Vacuum, etc) Valves installed in vaults or flood prone locations shall include an inflow preventer to prevent the introduction of contaminated water through the air valve outlet. The inflow preventer shall allow the admittance and exhausting of air while preventing contaminated water from entering during normal operating conditions. The inflow preventer shall be flow tested by an independent third party to certify performance. The third party shall be an approved testing lab of the American Society of Sanitary Engineers.

3.02 MANUFACTURE

A. The manufacturer shall demonstrate a minimum of five (5) years' experience in the manufacture of air valves. When requested, the manufacturer shall provide test certificates, dimensional drawings, parts list drawings, and operation and maintenance manuals.

B. The exterior of the valve shall be coated with a universal alkyd primer.

C. Air release valves shall be series 38 as manufactured by val-matic valve and manufacturing corporation, Elmhurst, IL, USA or approved equal.

END OF SECTION

SECTION 15263

PROCESS - AIR AND VACUUM REGULATED VALVES

PART 1 - GENERAL

1.01 SCOPE

A. This specification is intended to cover the design, manufacture, and testing of 1/2 in. (13 mm) through 20 in. (500 mm) Air/Vacuum Valves suitable for pressures up to 740 psig (5100 kPa) clean or raw water service.

B. Air/vacuum valves shall be fully automatic float operated valves designed to exhaust large quantities of air during the filling of a piping system and close upon liquid entry. The valve shall re-open during draining or if a negative pressure occurs. [Note: see air release valves for releasing air during system operation and combination air valves for both air release and air/vacuum functions.]

1.02 STANDARDS, APPROVALS AND VERIFICATION

A. Valves shall be manufactured and tested in accordance with American Water Works Association (AWWA) Standard C512.

B. Valves used in potable water service shall be certified to NSF/ANSI 61 Drinking Water System Components - Health Effects.

C. Manufacturer shall have a quality management system that is certified to ISO 9001 by an accredited, certifying body.

1.03 CONNECTIONS

A. Valve sizes 3 in. (76 mm) and smaller shall have full size NPT inlets and outlets equal to the nominal valve size. The body inlet connection shall be hexagonal for a wrench connection.

B. Valve sizes 4 in. (100 mm) and larger shall have bolted flange inlets with threaded or plain outlets and protective hoods to prevent debris from entering the valve. Flanges shall be in accordance with ANSI B16.1 for Class 125 or Class 250 iron flanges and ANSI B16.5 for Class 150 or Class 300 steel flanges.

C. The valve shall have two additional NPT connections for the addition of Air Release Valves, gauges, testing, and draining.

1.04 DESIGN

A. The valve body shall provide a through flow area equal to the nominal valve size. A bolted cover with alloy screws and flat gasket shall be provided to allow for maintenance and repair.

B. Floats shall be unconditionally guaranteed against failure including pressure surges. The float shall have a hexagonal guide shaft supported in the body by circular bushings to prevent binding from debris. The float shall be protected against direct water impact by an internal baffle.

C. The resilient seat shall provide drop tight shut off to the full valve pressure rating. The seat shall be a minimum of.5 in. (12 mm) thick on 2 in. (50 mm) and larger valves and secured in such a manner as to prevent distortion. Valves with working pressures above 400 psig (2760 kPa) shall have metal seats with synthetic seals.

D. On valve sizes 4 in. (100 mm) and larger, the cover shall be fitted to the valve body by means of a machined register to maintain concentricity between the top and bottom guide bushings at all times. The float shall be double guided with a guide shaft extending through the float to prevent any contact with the body. A resilient bumper shall be provided to cushion the float during sudden opening conditions.

PART 2 - PRODUCTS

2.01 MATERIALS

A. The valve body, cover, and baffle shall be constructed ASTM A351 Grade CF8M stainless steel for class 125 and class 250 valves.

B. The float, guide shafts, and bushings shall be constructed of type 316 stainless steel. Non-metallic guides and bushings are not acceptable. Resilient seats shall be Buna-n. Class 300 steel valves shall have a 316 stainless steel seat with Buna-n seal to provide an initial contact to Buna-n with final metal to metal contact to prevent over compression of the resilient seal.

2.02 OPTIONS

A. The material of the body shall be consistent with the Air/Vacuum Valve. The seat and disc shall be bronze.

B. An optional isolation valve shall be furnished under the Air/Vacuum valve. For sizes with threaded inlets, the isolation valve shall be a fully-ported brass ball valve. For sizes with flanged inlets, the isolation valve shall be an AWWA class 150B or 250B Butterfly Valve with quarter-turn gear actuator and handwheel.

PART 3 - INSTALLATION

3.01 CROSS CONTAMINATION AND SECURITY PROTECTION

A. All Air (Release, Vacuum, etc.) Valves installed in vaults or flood prone locations shall include an inflow preventer to prevent the introduction of contaminated water through the air valve outlet. The inflow preventer shall allow the admittance and exhausting of air while preventing contaminated water from entering during normal operating conditions. The inflow preventer shall be flow tested by an independent third party to certify performance. The third party shall be an approved testing lab of the American Society of Sanitary Engineers.

3.02 MANUFACTURE

A. The manufacturer shall demonstrate a minimum of five (5) years' experience in the manufacture of air valves. When requested, the manufacturer shall provide test certificates, dimensional drawings, parts list drawings, and operation and maintenance manuals.

B. The exterior of the valve shall be coated with a universal alkyd primer.

C. Air/Vacuum Valves shall be Series 100 as manufactured by Val-Matic Valve and Manufacturing Corporation, Elmhurst, Il, USA or approved equal.

END OF SECTION

SECTION 15065

PROCESS - STAINLESS STEEL PIPE AND FITTINGS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope: This section specifies stainless steel pipe and fittings.

B. Types of Service: Stainless steel piping specified in this Section shall be used for raw sewage discharge piping in the pump station wet well.

1.02 QUALITY ASSURANCE

A. References: This Section contains references to the following documents. They are a part of this Section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this Section as if referenced directly. In the event of conflict between the requirements of this Section and those of the listed documents, the requirements of this Section shall prevail.

Reference	Title
ANSI B16.1	Cast Iron Pipe Flanges and Flanged Fittings Classes 25, 125, 250, and 800
ANSI B16.11.80	Forged Steel Fittings, Socket Welding and Threaded
ANSI B31.1	Power Piping
ANSI B36.19M	Stainless Steel Pipe
ASME Section IX (1989)	Boiler and Pressure Vessel Code; Welding and Brazing Qualifications
ASTM A182/A182M	Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High Temperature Service
ASTM A193/A193M	Alloy-Steel and Stainless Steel Bolting Materials for High Temperature Service
ASTM A194/A194M	Carbon and Alloy Steel Nuts for Bolts for High Pressure and High Temperature Service
ASTM A240	Heat-Resisting Chromium and Chromium Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels
ASTM A276	Stainless and Heat-Resisting Steel Bars and Shapes
ASTM A312/A312M	Seamless and Welded Austenitic Stainless Steel Pipes
ASTM A320/A320M	Alloy Steel Bolting Materials for Low Temperature Service
ASTM A403/A403M	Wrought Austenitic Stainless Steel Piping Fittings
ASTM A409/A409M	Welded Large Diameter Austenitic Steel Pipe for Corrosive or High Temperature Service
ASTM A480/A480M	General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip
ASTM A774/A774M	As-Welded Wrought Austenitic Stainless Steel Fittings for General Corrosive Service at Low and Moderate Temperatures
ASTM A778	Welded, Un-annealed Austenitic Stainless Steel Tubular Products
AWS D18.1	Specification for Welding of Austenitic Stainless Steel Tube and Pipe Systems for Sanitary (Hygienic) Applications

B. Qualifications: All shop fabricated stainless steel pipe and fittings shall be furnished by a single manufacturer who is experienced and qualified in the manufacture and fabrication of the items to be furnished. The pipe and fittings shall be shop-fabricated and field-installed in accordance with common industry wide practices and methods and shall comply with these specifications. Only weld procedures which have been qualified under ASME Section IX and only welders who have successfully completed performance qualification tests per ASME Section IX on these qualified procedures shall be utilized.

C. Testing: Factory testing shall conform to the requirements of ASTM A312, ASTM A409 HT-0, or ASTM A778, depending on the size and type of stainless steel pipe provided.

1.03 SHOP DRAWINGS AND SUBMITTALS

A. Submittals shall be submitted to the County/Professional for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."

B. Shop fabrication drawings showing details of materials, piping, fittings, couplings, dielectric connections, joint locations and details, and types and locations of supports.

C. Certifications specified in the following documents:
1. ASTM A403, paragraph 14.1
2. ASTM A774, paragraph 14.1
3. ASTM A778, paragraph 14.1
4. ASTM A409, paragraph 17.1

D. Test results as specified in this Section.

E. Names and qualification records of proposed welders.

F. Other data necessary to show conformance of the piping system to these specifications.

PART 2 – PRODUCTS

1.04 GENERAL

A. All material supplied shall be one of the products specified in Appendix D "List of Approved Products" appended to these technical specifications.

1.05 PIPE

A. Unless otherwise specified, stainless steel piping 3-inches and larger shall be manufactured from ASTM A240 annealed and pickled sheets and plates, Type 304L, in accordance with ASTM A778 or ASTM A409 HT-0. Pipe shall be manufactured to nominal pipe sizes as listed in ANSI B36.19 and shall have nominal wall thickness corresponding to schedule 40S.

1.06 FITTINGS

A. Unless otherwise specified, stainless steel fittings 3-inch and larger shall be butt weld type manufactured in accordance with ASTM A774 of the same material and in the same thicknesses as the pipe. Long radius elbows less than 24-inches in diameter shall be smooth flow. All short radius, special radius, reducing, and long radius elbows 24-inches and greater in diameter shall be of mitered construction. Reducers shall be straight tapered cone type. Tees, crosses, laterals, and wyes shall be shop-fabricated from pipe.

1.07 FLANGED CONNECTIONS

A. Flanged joints shall conform to ANSI B16.1, Class 125, and in accordance with Table 10.23 of ANSI A21.10.

B. Flanged joints shall be bolted with through stud or tap bolts of required size as directed. Bolts and nuts shall conform in dimensions to the American Standard heavy series. Nuts shall be hexagonal, cold pressed. Bolts and nuts shall be Type 304 or 306 Stainless Steel.

C. Gaskets of "Cranite," red rubber, asbestos composition, or other approved quality shall be used in all flanged joints. Gaskets shall conform to the requirements of ANSI B16.21.

D. Flanged pipe approximately twelve (12) inches or less in length shall have flanges cast solidly to the pipe barrel. Flanged pipe over twelve (12) inches in length may have flanges welded in place in the field using approved welding materials and personnel.

E. Connections shall be capable of being mated to ductile iron pipe flanges or pump base elbow.

1.08 GASKETS

A. Gaskets shall conform to ANSI A21.11 and meet the requirements of NSF 61.

1.09 BOLTS

A. Bolts, nuts, and washers for stainless steel flange assemblies shall be Type 304 or 316 stainless steel with bolts and nuts conforming to ASTM A193 Grade B8M.

1.10 PIPE SUPPORT SYSTEMS

A. Unless otherwise specified, all hangers, rods, structural attachments, and other components of support systems for stainless steel pipe shall be of the same materials as the pipe.

1.11 FINISH

A. After all shop operations have been completed, pipe and fittings shall be pickled and passivated

in the manufacturer's plant, and scrubbed and washed until discoloration and possible iron picked up from manufacturing process are removed.

PART 3 EXECUTION

1.12 PIPE CUTTING, THREADING, AND JOINTING

A. Pipe cutting, threading, and jointing shall conform to the requirements of ANSI B31.1. All pipe threads shall be lubricated with Teflon tape.

1.13 WELDING

A. General: Piping with wall thickness up to 11-gauge (0.120-inch) shall be welded with the TIG (GTAW) process. Unless otherwise specified, heavier walls shall be properly beveled and have a root pass with the TIG (GTAW) process followed by subsequent passes with the TIG (GTAW), MIG (GMAW), or Metallic Arc (SMAW) process. Filler wire of ELC grades only shall be added to all welds to provide a cross section at the weld equal to or greater than the parent metal. Weld deposit shall be smooth and evenly distributed and have a crown of no more than 1/16-inch on the I.D. and 3/32-inch on the O.D. of the piping. Concavity, undercut, cracks, or crevices shall not be allowed. Butt welds shall have full penetration to the interior surface, and inert gas shielding shall be provided to the interior and exterior of the joint. Excessive weld deposits, slag, spatter, and projections shall be removed by grinding. Welds on gasket surfaces shall be ground smooth.

B. Field Welding: Field welding shall be minimized to the greatest extent possible by prefabrication of pipe systems at the factory. Pipe butt welds may be performed at the job site providing the butt welds are performed only with an inert gas shielded process and that other applicable specified welding requirements are rigidly adhered to. All residue, oxide, and heat stain is to be removed from any type of field weld and the affected adjacent areas by the use of stainless steel wire brushes. The field weld shall then be cleaned with an agent such as Eutectic Company's "Eucleen" or equal followed by complete removal of the agent.

C. Preparation of Surfaces to Be Welded: Surfaces of joints to be welded shall be free from mill scale, slag, grease, oil, paint, rust, and other foreign material. Joints to be welded shall be wire-brushed with stainless steel wire brushes and precisely fitted before welding.

D. Weather Conditions: Welding shall be done only when the surfaces are completely free of any moisture. Welding of the pipe shall not be done during periods of high winds or rain unless the areas being welded are properly shielded.

E. Tack Welds, Clips, and Other Attachments: Nicks, gouges, notches, and depressions in the base metal in the area of the joint shall be repaired before the joint weld is made. Tack welds, clips, and other attachments shall be removed and defects repaired, except where the tack welds occur within the weld area and these tack welds do not exceed the size of the completed weld. Cracked tack welds shall be removed. Areas to be repaired shall be ground to clean metal and then repaired by building up with weld metal. The repaired areas shall be ground smooth to form a plane surface with the base metal.

F. Defects and Repairs: Welds with cracks, slag inclusions, porosity, undercutting, incomplete penetration, or which are otherwise deficient in quality or made contrary to any provisions of these specifications shall be removed by chipping or grinding throughout their depth to clean base metal. Calking or peening of welds to correct defects shall not be done. Welds found deficient in dimension but not in quality shall be enlarged by additional welding after thoroughly cleaning the surface of previously deposited metal and the adjoining plate. Weld deposits, slag, weld spatter, and projections into the interior of the pipe shall be removed by grinding.

1.14 MARKING, SHIPPING, AND STORAGE

A. Pipe, fittings, and fabrications shall be properly marked with type, gauge, and heat number. Fabricated piping shall have openings plugged and flanges secured for storage or transport after fabrication. Fabricated piping shall be piece-marked with identifying numbers or codes which correspond to the Contractor's layout and installation drawings. The marks shall be located on the spools at opposite ends and 180° (degrees) apart. Pipe spools shall be loaded, blocked, and lagged as necessary to ensure protection from damage during shipping. Stainless steel pipe and fittings shall be stored per manufacturer's recommendation. Dents, gouges, and scratches in stainless steel pipe and fittings are not acceptable and are reason for rejecting pipe and fittings.

1.15 FABRICATION/INSTALLATION REQUIREMENTS

A. The piping supplier and the Contractor shall use extreme care to avoid the contact of any ferrous materials with the stainless steel piping during manufacturing, fabricating, handling, and

installation stages. All saws, drills, files, and wire brushes shall be used for stainless steel piping only. Pipe storage and fabrication racks shall be nonferrous, stainless steel, or rubber-lined. Nylon slings or straps shall be used for handling stainless steel piping. After installation, the Contractor shall wash and rinse all foreign matter from the piping surface. All welded joints shall be treated with a pickling solution, brushed with stainless steel wire brushes, and rinsed clean. If rusting of embedded iron occurs, the Contractor shall pickle the affected surface with Oakite Deoxidizer SS, or equal, scrub with stainless steel brushes, and rinse clean.

1.16 COATINGS

A. Painting of the stainless steel pipe is not required.

END OF SECTION

SECTION 15270
PROCESS - VALVES AND OPERATORS

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:
   1. American Gas Association (AGA): 3-88, Orifice Metering of Natural Gas.
   2. American National Standards Institute (ANSI): Z21.15, Manually Operated Gas Valves for Appliances, Appliance Connector Valves and Hose End Valves.
   3. American Society of Mechanical Engineers (ASME):
      a. B16.1, Gray Iron Pipe Flanges and Flanged Fittings (Classes 25, 125, and 250).
      b. B16.44, Manually Operated Metallic Gas Valves for Use in Aboveground Piping Systems up to 5 PSI.
   4. American Society of Sanitary Engineers (ASSE): 1011, Performance Requirements for Hose Connection Vacuum Breakers.
   5. American Water Works Association (AWWA):
      a. C111/A21.11, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
      b. C500, Metal-Seated Gate Valves for Water Supply Service.
      c. C504, Rubber-Seated Butterfly Valves.
      d. C507, Ball Valves, 6-in. through 48-in. (150-mm through 1200-mm).
      e. C508, Swing-Check Valves for Waterworks Service, 2-in. through 24-in. (50-mm through 600-mm) NPS.
      f. C509, Resilient-Seated Gate Valves for Water Supply Service.
      g. C510, Double Check Valve, Backflow Prevention Assembly.
      h. C511, Reduced-Pressure Principle Backflow Prevention Assembly.
      i. C540, Power-Actuating Devices for Valves and Slide Gates.
      j. C550, Protective Interior Coatings for Valves and Hydrants.
      k. C606, Grooved and Shouldered Joints.
      l. C800, Underground Service Line Valves and Fittings.
   6. ASTM International (ASTM):
      a. A276, Standard Specification for Stainless Steel Bars and Shapes.
      b. A351/A351M, Standard Specification for Castings, Austenitic, for Pressure-Containing Parts.
      c. A564/A564M, Standard Specification for Hot-Rolled and Cold-Finished Age-Hardening Stainless Steel Bars and Shapes.
      d. B61, Standard Specification for Steam or Valve Bronze Castings.
      e. B62, Standard Specification for Composition Bronze or Ounce Metal Castings.
      f. B98/B98M, Standard Specification for Copper-Silicon Alloy Rod, Bar, and Shapes.
      g. B127, Standard Specification for Nickel-Copper Alloy (UNS N04400) Plate, Sheet, and Strip.
      h. B139, Standard Specification for Phosphor Bronze Rod, Bar and Shapes.
      i. B164, Standard Specification for Nickel-Copper Alloy Rod, Bar, and Wire.
      j. B194, Standard Specification for Copper-Beryllium Alloy Plate, Sheet, Strip, and Rolled Bar.
      k. B584, Standard Specification for Copper Alloy Sand Castings for General Applications.
      l. D429, Standard Test Methods for Rubber Property-Adhesion to Rigid Substrates.
      m. D1784, Standard Specification for Rigid PolyVinyl Chloride (PVC) Compounds and Chlorinated PolyVinyl Chloride (CPVC) Compounds.
   7. Canadian Gas Association, Inc. (CGA): 9.1, Manually Operated Gas Valves for Appliances, Appliance Connector Valves and Hose End Valves.
   8. FM Global (FM).
   9. Food and Drug Administration (FDA).
   10. International Association of Plumbing and Mechanical Officials (IAPMO).

11. Manufacturers Standardization Society (MSS):
    a. SP-80, Bronze Gate, Globe, Angle and Check Valves.
    b. SP-81, Stainless Steel, Bonnetless, Flanged Knife Gate Valves.
    c. SP-85, Gray Iron Globe & Angle Valves, Flanged and Threaded Ends.
    d. SP-88, Diaphragm Valves.
    e. SP-110, Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends
12. NSF International (NSF): 61, Drinking Water System Components- Health Effects.
13. Underwriters Laboratories (UL).
14. USC Foundation for Cross-Connection Control and Hydraulic Research.

1.02 SUBMITTALS

A. Action Submittals:
    1. Shop Drawings:
        a. Product data sheets for each make and model. Indicate valve Type Number, applicable Tag Number(s), and facility name/number or service where used.
        b. Complete catalog information, descriptive literature, specifications, and identification of materials of construction.
        c. Power and control wiring diagrams, including terminals and numbers.
        d. For each power actuator provided, Manufacturer's standard data sheet, with application specific features and options clearly identified.
        e. Sizing calculations for open-close/throttle and modulating valves.

B. Informational Submittals:
    1. Manufacturer's Certificate of Compliance. Manufacturers' Field Services for:
        a. Electric actuators; full compliance with AWWA C540.
        b. Butterfly valves; full compliance with AWWA C504.
    2. Certification for compliance to NSF 61 for valves used for drinking water service.
    3. Tests and inspection data.
    4. Operation and Maintenance Data.
    5. Manufacturer's Certificate of Proper Installation.

PART 2 PRODUCTS

2.01 GENERAL

A. Valves to include operator, actuator, handwheel, chain wheel, extension stem, floor stand, operating nut, chain, wrench, and accessories to allow a complete operation from the intended operating level.

B. Valve to be suitable for intended service. Renewable parts not to be of a lower quality than specified.

C. Valve same size as adjoining pipe, unless otherwise called out on Drawings or in Supplements.

D. Valve ends to suit adjacent piping.

E. Resilient seated valves shall have no leakage (drip-tight) in either direction at valve rated design pressure. All other valves shall have no leakage (drip-tight) in either direction at valve rated design pressure, unless otherwise allowed for in this section or in stated valve standard.

F. Size operators and actuators to operate valve for the full range of pressures and velocities.

G. Valve to open by turning counterclockwise, unless otherwise specified.

H. Factory mount operator, actuator, and accessories.

2.02 SCHEDULE

A. Additional requirements relative to this section are shown on Valve Schedules located on the plan sheets.

2.03 MATERIALS

A. Bronze and brass valve components and accessories that have surfaces in contact with water to be alloys containing less than 16 percent zinc and 2 percent aluminum.
   1. Approved alloys are of the following ASTM designations: B61, B62, B98/B98M (Alloy UNS No. C65100, C65500, or C66100), B139 (Alloy UNS No. C51000), B584 (Alloy UNS No. C90300 or C94700), B164, B194, and B127.
   2. Stainless Steel Alloy 18-8 may be substituted for bronze.

B. Valve materials in contact with or intended for drinking water service to meet the following requirements:
   1. Comply with requirements of the Safe Drinking Water Act and other applicable federal, state, and local requirements.
   2. Coatings materials to be formulated from materials deemed acceptable to NSF61.
   3. Furnish certification that product is certified as suitable for contact with drinking water by an accredited certification organization in accordance with NSF 61. Provide certification for each valve type used for drinking water service.

2.04 FACTORY FINISHING

A. Epoxy Lining and Coating:
   1. Use where specified for individual valves described herein.
   2. In accordance with AWWA C550 unless otherwise specified.
   3. Either two-part liquid material or heat-activated (fusion) material except only heat-activated material if specified as "fusion" or "fusion bonded" epoxy.
   4. Minimum 7-mil dry film thickness except where limited by valve operating tolerances.

B. Exposed Valves:
   1. Safety isolation valves and lockout valves with handles, handwheels, or chain wheels "safety yellow."

2.05 VALVES

A. Globe Valves:
   1. Type V200 Globe Valve 3 Inches and Smaller:
      a. Stainless steel, union bonnet, packed gland, inside screw, rising stem, TFE disc, Class 150 rated 150 psi SWP/300 psi CWP, complies with MSS SP-80 Type 2.
      b. Manufacturers:
         1) Stockham;
         2) Crane Co.;
         3) Milwaukee;
         4) NIBCO;

B. Ball Valves:
   1. Type V300 Ball Valve 3 Inches and Smaller for General Water and Air Service:
      a. Two-piece, standard port, NPT threaded ends, stainless steel body and end piece, hard chrome-plated solid bronze or brass ball, RTFE seats and packing, blowout-proof stem, adjustable packing gland, zinc-coated steel hand lever operator with vinyl grip, rated 600-pound WOG, 150-pound SWP, complies with MSS SP-110.
      b. Manufactures:
         1) Stockham;
         2) Crane Co.;
         3) Milwaukee;
         4) NIBCO
   2. Type V330 PVC Ball Valve 2 Inches and Smaller:
      a. Rated 150 psi at 73º F, with ASTM D1784, Type I, Grade 1 polyvinyl chloride body, ball, and stem, end entry, double union design, solvent-weld socket ends, elastomer seat, Viton or Teflon O-ring stem seals, to block flow in both directions.
      b. Manufacturers and Products:
         1) Nibco; Chemtrol Tru-Bloc.

2) ASAHI/America; Type 21.
3) Spears; True Union.

C. Butterfly Valves:
1. Refer to Section 15271

D. Check and Flap Valves:
1. Swing Check Valve:
a. Checks valves shell be of swing type and shall meet the material requirements of AWWA specification C508.
b. The valve shall be iron body (epoxy coated), bronze mounted, single disc for non-shock working pressure 175 psi 4"-8" and hydrostatically tested at twice the working pressure.
c. The sect ring shall be bronze or stainless steel (renewable). The disc shall be bronze. The flange shall be Class 125. A Buna-N seal shall be furnished to provide zero leakage. The Buna-N seal shall be vulcanized to the flapper plate and may not be glued or chemically adhered.
d. The valve shall be so constructed that by simply unbolting and lifting off the cover, the internal working parts may be easily removed and replaced without removing the valve from the line.
e. The valve shall be of the conventional swing check style provided with a lever and weight or lever and spring assisted closure.
f. The valve shall be constructed to accept a pneumatic cylinder that effectively eliminates water hammer when properly applied.
g. The valve shall permit flow in one direction only; be tight seating when the outlet pressure exceeds the inlet pressure and be suitable for mounting in horizontal or vertical lines.
h. Manufacturers and Products:
1) Flowmatic 92LW
2. Wafer Check Valve:
a. Manufacturers and Products:
1) Flowmatic 812X

E. Self-Regulated Automatic Valves:
1. Refer to Section 15216, 15262, and 15263.

F. Miscellaneous Valves:
1. Type V999 Flow Control Valve 3 Inches and Larger:
a. Hydraulically operated, diaphragm actuated, electronic pilot controlled globe valve, ductile iron body, ANSI Class 150 flanged ends, rated 250 psi, bronze or stainless steel trim, stainless steel stem, externally mounted strainers with cocks, and position transmitter.
b. Valve shall include dual pilot solenoid valves to control flow through valve based on remote open or close pulse signal received from plant SCADA system.
c. FDA or NSF 61 approved fusion-bonded epoxy lining and coating installed in accordance with AWWA C550.
d. Size: 16-inch reduced port.
e. Manufacturer and Product:
1) Cla-Val; 631-01.
2) Or approved equal.

2.06 OPERATORS AND ACTUATORS

A. Manual Operators:
1. General:
a. For AWWA valves, operator force not to exceed requirements of the applicable valve standard. Provide gear reduction operator when force exceeds requirements.

1) Operator self-locking type or equipped with self-locking device.
2) Position indicator on quarter-turn valves. Locate position indicator so it is always readable from normal operation level.
3) Worm and gear operators one-piece design, worm-gears of gear bronze material. Worm of hardened alloy steel with thread ground and polished. Traveling nut type operator's threaded steel reach rod with internally threaded bronze or ductile iron nut.

b. Exposed Operator:
1) Galvanized and painted handwheel.
2) Cranks on gear type operator.
3) Chain wheel operator with tieback, extension stem, floor stand, and other accessories to permit operation from normal operation level.
4) Valve handles to take a padlock, and wheels a chain and padlock.

c. Manual Operator with Limit Switch:
1) Factory installed NEMA 4X limit switch by actuator manufacturer.
2) SPST, rated at 5 amps, 120V ac.

2.07 ACCESSORIES

A. Tagging: See Schedule 15190 Mechanical Identification.

B. Chain Wheel and Guide:
1. Handwheel direct-mount type.
2. Complete with chain (where applicable).
3. Galvanized or cadmium-plated.
4. Manufacturers and Products:
a. Clow Corp.; Figure F-5680.
b. Walworth Co.; Figure 804.
c. DeZurik Corp.; Series W or LWG. condensation.
d. Engineer approved alternate.

PART 3 EXECUTION

3.01 INSTALLATION

A. Flange Ends:
1. Flanged valve bolt holes shall straddle vertical centerline of pipe.
2. Clean flanged faces, insert gasket and bolts, and tighten nuts progressively and uniformly.

B. Screwed Ends:
1. Clean threads by wire brushing or swabbing.
2. Apply joint compound.

C. PVC Valves: Install using solvents approved for valve service conditions.

D. Valve Installation and Orientation:
1. General:
a. Install valves so handles operate from fully open to fully closed without encountering obstructions.
b. Install valves in location for easy access for routine operation and maintenance.
c. Install valves per manufacturer's recommendations.
2. Ball Valves:
a. Install operating stem vertical when valve is installed in horizontal runs of pipe having centerline elevations 4 feet 6 inches or less above finished floor, unless otherwise shown.
b. Install operating stem horizontal in horizontal runs of pipe having centerline elevations greater than 4 feet 6 inches above finish floor, unless otherwise shown.
3. Butterfly Valves:

a. Unless otherwise restricted or shown on Drawings, install valve a minimum of 8 diameters downstream of a horizontal elbow or branch tee with shaft in horizontal position.
b. For vertical elbow or branch tee immediately upstream of valve, install valve with shaft in vertical position.
c. For horizontal elbow or branch tee immediately upstream of valve, install valve with shaft in horizontal position.

E. Install a line size ball valve and union upstream of each in-line flow switch, or other in-line electrical device, excluding magnetic flowmeters, for isolation during maintenance.

F. Locate valve to provide accessibility for control and maintenance. Install access doors in finished walls and plaster ceilings for valve access.

G. Chain Wheel and Guide: Install chain wheel and guide assemblies or chain lever assemblies on manually operated valves over 6 feet 9 inches above finish floor. Install chain to within 3 feet 0 inch of finish floor. Where chains hang in normally traveled areas, use appropriate "L" type tie-back anchors. Install chains to within operator horizontal reach of 2 feet 6 inches maximum, measured from normal operator standing location or station.

3.02 TESTS AND INSPECTION

A. Valve may be either tested while testing pipelines, or as a separate step.

B. Test that valves open and close smoothly under operating pressure conditions. Test that two-way valves open and close smoothly under operating pressure conditions from both directions.

C. Inspect air and vacuum valves as pipe is being filled to verify venting and seating is fully functional.

D. Count and record number of turns to open and close valve; account for any discrepancies with manufacturer's data.

E. Set, verify, and record set pressures for relief and regulating valves.

F. Automatic valves to be tested in conjunction with control system testing. Set opening and closing speeds, limit switches, as required or recommended by Engineer.

3.03 MANUFACTURER'S SERVICES

A. Manufacturer's Representative: Present at Site for minimum person-days listed below, travel time excluded:
1. 1 person-day for installation assistance and inspection.
2. 1 person-day for functional testing and completion of Manufacturer's Certificate of Proper Installation.

END OF SECTION

SECTION 15271

PROCESS - MOTOR OPERATED BUTTERFLY VALVES

PART 1 GENERAL

1.01 SUMMARY

A. Motor Operated valve and operators, mechanical design and motor controls.

B. Valve & Actuator Assembly & Testing

C. Installation & Testing.

1.02 REFERENCES

A. American Water Works Association (ANSI/AWWA C540-02 Power-Actuating Devices for Valves and Slide Gates)

B. National Electrical Manufacturer's Association (NEMA)

1.03 SUBMITTALS

A. A. Design Data: Submit operating torque calculations for each valve size and class. Show minimum and maximum rated torque output for the operators supplied. Size operators for 2 times the maximum valve seating/unseating torque.

B. Manufacturer's catalog information, descriptive literature, and specifications.

C. Electrical wiring diagrams, for each assembly.

D. Manufacturer's Installation & Operating Instructions

E. Equipment Assembly: Make, model, and weight of each assembly.

1.04 QUALITY ASSURANCE

A. All manufacturers must have at least 10 years

B. Special shipping, storage and protection, and handling instructions.

C. Certificate of Proper Installation & Operation

PART 2 PRODUCTS

2.01 ELECTRIC ACTUATOR

A. Manufacturer:
   1. AUMA, or approved equal

B. Electric Actuator Design:
   1. Actuator Sizing
      a. The actuator shall be sized for an operating torque equal to twice the maximum required valve operating torque under the specified flow conditions.
      b. The operating speed shall provide valve closing and opening at approximately 60 seconds for quarter turn valves. Actuator shall have an Interface Board for pulse control to extend the stroke time as programmed/controlled from the PLC.
      c. Isolation service actuators shall have 60 start/stops per hour rating and modulating service valves shall have up to 1200 start/stops per hour rating
   2. Environmental
      a. Actuators shall be suitable for indoor and outdoor use. The actuator shall be capable of functioning in an ambient temperature ranging from -20°F to +140°.
   3. Enclosure
      a. Actuators shall be o-ring sealed, watertight and weatherproof CSA-US Type 4 enclosure. All external fasteners shall be of stainless steel. All gear cases shall be cast iron.
   4. Motor
      a. Motor Voltage shall be 480/3/60. The electric motor shall be Class F insulated, with a duty rating of at least 15 minutes at 104°F (40°C). Motor shall be specifically designed and built by the actuator manufacturer for electric actuator service.

Commercially available motors shall not be acceptable. Electrical disconnection of the motor shall be by means of a plug and socket and motor removal shall be possible without loss of lubricant.

5. Motor Protection
   a. The following criteria shall be provided for motor protection: The motor shall be de-energized in the event of an over torque condition; A minimum of three thermal devices imbedded in the motor windings shall be provided to de-energize the motor in case of overheating.
6. Gearing
   a. The actuator gearing shall be totally enclosed in a grease-filled cast iron gear case suitable for operation in any orientation. Actuator gearing shall be hardened steel with alloy bronze worm wheel. Where required per application, electric actuators will be provided with worm gearboxes. The worm gearboxes shall be supplied with full
   b. 360° bronze worm wheels and end-of-travel mechanical stops on the worm shaft. Designs with segmented worm gears and end-of-travel stops in the gearbox housing will not be permitted.
7. Manual Operation
   a. Manual operation shall be by handwheel. Manual operation shall utilize the actuator worm shaft/worm wheel to maintain self-locking gearing and to facilitate changeover from motor to manual operation when the actuator is under load. The declutching from motor operation shall be at the motor shaft to minimize declutching effort. Return from manual to electric mode of operation will be automatic upon motor operation. A seized or inoperable motor shall not prevent manual operation.
8. Valve Position Switches
   Limit switches shall be furnished at each end of travel. Limit switch adjustment shall not be altered by manual operation. Limit switch drive shall be by counter-gear. Limit switches must be capable of quick adjustment requiring no more than five (5) turns of the limit switch adjustment spindle.
   a. Motor Control: One set of normally open and one set of normally closed contacts shall be furnished at each end of travel.
   b. Position Indication: One set of normally open and one set of normally closed contacts shall be furnished at each end of travel.
   c. Intermediate Positions: Two set of normally open and two set of normally closed contacts shall be furnished for intermediate positions, where indicated.
9. Torque Switches
   a. Mechanically operated torque switches shall be furnished at each end of travel. Torque switches will trip when the valve load exceeds the torque switch setting. The torque switch adjustment device must be calibrated directly in engineering units of torque in foot pounds.
10. Position Transmitter
    a. The actuator shall have an RWG position transmitter with 4 - 20 mA output and be
    b. internally powered with 24 VDC.
11. Motor Controls
    All actuators shall be furnished with Auma AM01.2 Electromechanical Motor Controls. The use of microprocessor programmable motor controls shall not be acceptable. Motor controls shall include:
    a. Reversing Starters - Mechanically & Electrically Interlocked
    b. Control Transformer
    c. 24 VDC Interface Board (pulse control)
    d. Control Inputs: OPEN / CLOSE
    e. Collective Fault Relay (potential-free NO/NC contact max. 250 VAC / 0.5A) for (torque fault, phase failure, motor thermal switch tripped)
    f. 4 potential-free NO contacts with one common (max 250 VAC / 0.5 A) configured as follows: CLOSED position reached; OPEN position reached; selector switch in REMOTE; selector switch in LOCAL

g. Local Controls with 3 Push Buttons, Selector Switch and 3 Pilot Lights

12. Wiring and terminals
    a. Internal wiring shall be tropical grade insulated stranded cable of appropriate size for the control and 3-phase power. All external wiring shall terminate in a removable plug and socket head, which allows easy disconnection of all power and control voltages.
    b. A double seal shall be included to protect against the ingress of water and/or dust.
13. This specification applies specifically to the following valves: V101, V102A, V102B, V104, V105A, V105B, V106A, V106B, V107A, and V107B.
14. The actuator shall be the Auma SA07.6-54B/GS100.3/VZ4.3/AM01.2 as supplied by Specialty Controls Inc, Duvall, WA

2.02 BUTTERFLY VALVES

A. Manufacturer and model:
   1. Pratt HP250II

B. Butterfly Valve Design
   1. All butterfly valves shall be of the tight-closing, rubber-seated type, conforming to the design standards of ANSI/AWWA C504 latest revision, except where noted herein. Valves shall be bubble-tight at the rated pressure in either direction and shall be suitable for a maximum of 16 fps flow. Maximum operating non-shock shut-off pressure and maximum operating non-shock line pressure is 150 psi.
   2. All items shall have the name or symbol of the manufacturer, the nominal size, date of manufacture, and the working pressure for which they are designed, cast, stamped, or permanently marked on the body.
   3. Butterfly valves shall be Class 150B, and of the flanged short body design. The valve bodies shall be constructed of cast iron ASTM A-126, Class B with ANSI B16.1 flange drilling.
   4. Discs for valve sizes 3” - 20” shall be of the concentric design. Valve discs shall be constructed epoxy coated ductile iron ASTM A-536 for sizes 10” to 20”. Valve disc shall have a 316 stainless steel seating edge. Valve disc shall seat at 90 degrees to the access of the pipe and shall require no torque to hold it in the closed position.
   5. Valves 3” - 20” shall have a one piece through shaft constructed of stainless steel ASTM A-276, grade 304, corresponding to the requirements of AWWA C504, latest revision. The shaft shall be fastened to the disc by means of a threaded disc pin providing a positive leak proof connection of the shaft to the disc. The use of taper pins for the shaft/disc connection is not acceptable.
   6. The resilient seat shall be Buna-N for valves 3” - 20” and shall be simultaneously bonded and vulcanized to body of the valve. All interior surfaces in contact with water, excluding stainless steel and disc, shall be completely rubber lined. Seats for valves 3”-20” shall be designed so that they will require no internal adjustment or maintenance to seat against a pressure differential of 150 psi on either side of the valve.
   7. All bearings shall be of the self-lubricating, corrosion-resistant, sleeve type. Bearings shall be designed for horizontal and/or vertical shaft loading. The valve assembly shall be furnished with a factory set two-way thrust bearing designed to center the valve disc in the valve seat at all times.
   8. Shaft packing shall be of the V-type, self-adjusting type and suitable for pressure and vacuum service.
   9. The interior of valves 3” - 20” shall be completely rubber lined. The valve disc shall either be ductile iron with epoxy coating from an AWWA NSF-61 coating system. The use of liquid epoxy on body interior surfaces shall not be allowed.
   10. The exterior surfaces shall be cleaned and sandblasted and coating shall be applied in accordance with the Manufacturer’s instructions. The coating material shall be PotaPox as manufactured by Tnemec, or equal. The coating material shall be applied in a minimum of two coats, at 4-5 mils per coat; the total dry thickness shall be 8- 10 mils.

2.03 VALVE & ACTUATOR ASSEMBLY & SHOP TESTING

2.04 ASSEMBLY

A. The actuator vendor shall assembly and calibrate the valve and actuator assembly in his shop prior to shipment.

B. The assembly shall be bench tested with cycle times as indicated in this specification. Factory authorized vender shall be Specialty Controls Inc. Duvall, WA

EXECUTION

3.01 INSTALLATION

A. Installation shall be in strict accordance with the Manufacturer's printed recommendations, and the Contract Documents. Valve shaft shall be horizontal as indicated.

B. Four (4) copies of Final Operations and Maintenance Manuals are to be provided. The manuals shall include but not be limited to the following: installations and adjustment instructions; maintenance procedures and operation parameters; wiring diagrams; control diagrams; and parts list.

3.02 FIELD QUALITY CONTROL

A. Upon completion of installation of the motor operated butterfly valves, an acceptance test shall be conducted to verify the satisfactory operation of the valves. The valves must perform in a manner acceptable to the Engineer before final acceptance will be made by the owner.

B. Start-Up & Training - Actuator Representative Services
   1. The factory authorized actuator representative shall provide start-up services to include; Installation Review, Programming and Cycle Acceptance Testing. In addition, provide a Certificate or Proper Installation & Operation.
   2. Training shall be provided to the water treatment plant personnel to provide for basic operation and maintenance.
   3. One site visit shall be included for 2 days to provide for the above.

END OF SECTION

SECTION 15281

PROCESS - UV ABSORBANCE AND TRANSMITTANCE SENSOR

PART 1 GENERAL

1.01 SECTION INCLUDES

A. SENSOR FOR CONTINUOUS MONITORING OF UV ABSORBANCE AND PERCENT TRANSMITTANCE IN WATER.

1.02 MEASUREMENT PROCEDURES

A. The method of measuring UV absorbance and percent transmittance will be by determining the Spectral Absorption Coefficient (SAC) at a wavelength of 254 nm using a 2-beam ultra-violet absorption technology with a 1, 2, 5, or 50 mm path length.

1.03 ALTERNATES

A. Other instruments that do not use 2-beam absorption technology are not acceptable.

B. Instruments that require the use of reagents are not acceptable.

C. Instruments that are not in accordance with DIN 38404 C3 are not acceptable.

1.04 SYSTEM DESCRIPTION

A. Performance Requirements
   1. Measurement range:
      a. 0.01 to 60 mm-1 at 50 mm, or
      b. 0.1 to 600 mm-1 at 5 mm, or
      c. 0 to 1500 mm-1 at 2 mm, or
      d. 2 to 3000 mm-1 at 1 mm
   2. Compensation: 550 nm
   3. Measurement interval: 1 minute

1.05 CERTIFICATIONS

A. A. UL 61010A-1 (Listed by 3rd party OSHA accredited NRTL)

B. B. CSA C22.2 No. 1010.1 (Certified by 3rd party SCC accredited Lab)

C. C. Certified by Hach to EN 61010-1 (IEC1010-1) per 73/23/EEC, supporting test records by Intertek Testing Services.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Operational Criteria
   1. Sample flow rate: 0.5 L/hour minimum for bypass sensors
   2. Sample pressure at inlet: 0.5 bar (7.25 psi) maximum for tank sensors
   3. Sample temperature: 2 to 40 °C (35 to 104 °F)
   4. Sample pH: 4.5 to 9 pH

1.07 WARRANTY

A. The product includes a one-year warranty from the date of substantial completion.

1.08 MAINTENANCE SERVICE

A. Scheduled maintenance:
   1. 1. Visual inspection: weekly
   2. 2. Calibration: Comparative measurement weekly (depending on ambient conditions)
   3. 3. Wiper blade: As per counter or yearly
   4. 4. O-ring through-flow unit replacement: yearly

B. Unscheduled maintenance
   1. Cleaning as needed based on environmental conditions.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Hach Company, Loveland, CO
   1. Model UVAS sc UV Absorbance / %Transmittance Sensor

2.02 MANUFACTURED UNIT

A. A. The UVAS sc UV Absorbance / %Transmittance Sensor consists of:
   1. Sensor:
      a. Stainless steel housing
      b. Self-cleaning wiper system

2.03 EQUIPMENT

A. The detector window of the sensor is automatically cleaned by a built-in wiper that eliminates surface films or particles.

B. The sensor operates with diagnostic routines to reduce calibration and maintenance.

2.04 COMPONENTS

A. Standard equipment:
   1. Sensor
   2. Cable
   3. Manual

B. Dimensions:
   1. 13.11 inches long (333 mm)
   2. 2.75 inches diameter (70 mm)

C. Weight: 7.9 pounds (3.6 kg)

D. Connectors: 32.8 feet (10 m) cable

2.05 ACCESSORIES

A. Bypass panel

B. Mounting hardware

PART 3 EXECUTION

3.01 INSTALLATION

A. Contractor will install the sensor in strict accordance with the manufacturer's instructions and recommendation.

B. Manufacturer's representative will include a half-day of start-up service by a factory-trained technician, if requested.
   1. Contractor will schedule a date and time for start-up.
   2. Contractor will require the following people to be present during the start-up procedure.
      a. Contractor
      b. Electrical contractor
      c. Hach Company factory trained representative
      d. Owner's personnel
      e. Owner's representative

END OF SECTION

SECTION 15282

PROCESS - TURBIDITY MEASUREMENT EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Turbidimeter for monitoring sample low-range (0.001 to 100 NTU) turbidity.

1.02 MEASUREMENT PROCEDURES

A. The method of measuring turbidity will nephelometric.
   1. Incandescent light will be directed into the sample stream in the turbidimeter body.
   2. The light scattered at 90 degrees will be sensed by a submerged photocell in the measuring chamber.

B. The method will meet or exceed instrument design criteria set by USEPA method 180.1 and Standard Methods 2130B

1.03 ALTERNATES

A. Other methods of turbidity measurement, such as those that require a sample cell with glass window that can foul or fog or require air purge, desiccant, or cleaning, are not acceptable.

1.04 SYSTEM DESCRIPTION

A. Performance Requirements
   1. Measurement range: 0.001 to 100 Nephelometric Turbidity Units (NTU).
   2. Accuracy
      a. ±2 percent of reading or ±0.020 NTU (whichever is greater) from 0 to 10 NTU
      b. percent of reading from 10 to 40 NTU
      c. ±10 percent of reading from 40 to 100 NTU
   3. Minimum detection limit: 0.001 NTU
   4. Resolution
      a. 0.0001 NTU up to 9.9999 NTU
      b. b. 0.001 NTU from 10.000 to 99.999 NTU
   5. Repeatability: ±1.0% of reading or ±0.002 NTU, whichever is greater

1.05 CERTIFICATIONS

A. Not applicable

1.06 ENVIRONMENTAL REQUIREMENTS

A. A. Operational Criteria
   1. Sample flow rate: 200 to 650 mL/minute
   2. Sample temperature: 0 to 50 degrees C
   3. Operating temperature: 0 to 40 degrees C
   4. Operating humidity: 5 to 95 percent non-condensing

1.07 WARRANTY

A. The product includes a one-year warranty from the date of substantial completion.

1.08 MAINTENANCE SERVICE

A. Scheduled maintenance:
   1. Calibration: as experience dictates.
      a. Use an optical based calibration/verification module.
      b. OR, use formazin-based standards.

B. Unscheduled maintenance
   1. 1. Clean photocell window
   2. 2. Clean instrument enclosure
   3. 3. Clean bubble trap
   4. 4. Lamp replacement

PART 2 PRODUCTS

2.01 MANUFACTURER

A. HACH COMPANY, LOVELAND, CO
   1. Model 1720E Turbidimeter

2.02 MANUFACTURED UNIT

A. The 1720E Turbidimeter consists of an incandescent light source, photocell, and bubble trap.

B. The 1720E is housed in a NEMA 4X/IP66 enclosure made of corrosion-resistant polysterine.

C. The optical components of the 1720E are mounted in a sealed, removable head assembly.

2.03 EQUIPMENT

A. The 1720E operates using 100 to 230 volt selectable AC power.

B. The 1720E operates continuously.

C. The sample stream into the 1720E flows through an internal bubble trap.

2.04 COMPONENTS

A. Standard equipment:
   1. Turbidimeter sensor head
   2. Turbidimeter body
   3. Manual

B. Dimensions:
   1. Width: 12.3 inches
   2. Height: 15.1 inches
   3. Depth: 9.4 inches

C. Weight: 13.5 pounds

D. Connectors
   1. Sample inlet fitting: 0.25-inch NPT female, 0.25-inch compression fitting
   2. Drain fitting: 0.5-inch NPT female, 0.5-inch hose barb

2.05 ACCESSORIES

A. Calibration/verification module (Model ICE-PIC for 1720E)

B. StablCal® verification standards

C. Formazin calibration kit for user-prepared calibration

D. Floor stand

PART 3 EXECUTION

3.01 PREPARATION

A. Wall mount

B. Clearances: none required.

C. Storage temperature: -20 to 60 degrees C

3.02 INSTALLATION

A. Contractor will install the turbidimeter in strict accordance with the manufacturer's instructions and recommendation.

B. Manufacturer's representative will include a half-day of start-up service by a factory-trained technician.
   1. Contractor will schedule a date and time for start-up.
   2. Contractor will require the following people to be present during the start-up procedure
      a. Contractor
      b. Hach Company factory trained representative

c. Owner's representative.

END OF SECTION

SECTION 15283
PROCESS - PH SENSOR EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sensor that continuously measures pH in aqueous solutions.

1.02 MEASUREMENT PROCEDURES

A. The method of measuring pH will be with a probe or sensor that uses differential electrode measurement technique using three electrodes.
   1. Two electrodes compare the process value to a stable internal reference standard buffer solution.
   2. The internal electrode is non-flowing, foul-resistant characteristics.

1.03 ALTERNATES

A. Other methods of pH measurement including combination probes will not be accepted.

B. Probes or sensors that do not communicate with the Hach model sc100 or sc1000 digital controller will not be accepted.

1.04 SYSTEM DESCRIPTION

A. Performance Requirements
   1. Measurement range: 0 to 14 pH
   2. Sensitivity: 0.005 pH
   3. Stability: 0.03 pH per 24 hours, non-cumulative

1.05 CERTIFICATIONS

A. General Purpose CSA/CSANRTL and FM (UL Pending) when used with an approved controller.

B. Class 1, Div 2 Groups A thru D CSA/CSANTRL and FM (UL Pending) when used with an approved controller.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Operating Criteria
   1. Temperature range: 23 to 203 °F (-5 to 95 °C)
   2. Sample flow rate: 3 meters (10 feet) per second, maximum
   3. Pressure: 100 pounds per square inch at 221 °F (6.9 bar at 105 °C)
   4. Transmission distance: 1000 meters (3240 feet), maximum

1.07 WARRANTY

A. The product includes a 30-month pro-rated warranty from the date of shipment.
   1. 0 to 12 months: 100% free from manufacturer defects
   2. 0 to 18 months: replaced at 1/3 current list price for any reason
   3. 19 to 30 months: replaced at 2/3 current list price for any reason

1.08 MAINTENANCE SERVICE

A. Scheduled maintenance:
   1. Condition/site dependent includes:
      a. Occasional wipe of electrode with mild soap solution
      b. Soak sensor for 2 to 3 minutes
      c. Use small bristle brush to scrub measuring end of sensor
   2. Twice yearly: replace salt bridge and pH buffer

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Hach Company, Loveland, CO
   1. Hach model pHD-SC pH Sensor

2.02 MANUFACTURED UNIT

A. The Hach pHD-SC pH Sensor consists of:
   1. Encapsulated sensor with digital signal processor, pre-amplifier, reference electrode, measuring electrode, ground electrode, and replaceable salt bridge.
   2. Integral 10-meter cable
   3. Wetted material [select one]:
      a. PEEK®
      b. Ryton®

2.03 EQUIPMENT

A. The Hach pHD-SC sensor works with Hach models sc100 or sc1000 controllers only.

B. The probe has a built in Pt 1000 RTD temperature compensator.

C. Mounting styles are as follows:
   1. 1-inch NPT threads on both ends to mount into:
      a. Standard 1-inch pipe tee
      b. GLI adapter pipe for union mount with standard 1.5-inch tee
      c. End of pipe for immersion into vessel
   2. For PEEK® housing only [select one]:
      a. Insertion body style: 1-inch NPT threads only on the cable end to mount into a GLI ball valve hardware assembly so that the sensor can be inserted into or retracted from the process without stop to the process flow.
      b. Sanitary body style: 2-inch flange to mount into GLI 2-inch sanitary tee with special cap and EDPM compound gasket.

2.04 COMPONENTS

A. Standard equipment:
   1. Probe
   2. Salt bridge
   3. 10-meter integral cable
   4. Manual

B. Dimensions
   1. Length: 10.75 in. (28.8 cm)
   2. Diameter 1.25 in. (3.1 cm)
   3. Weight: 11 oz. (0.316 kg)

C. Accessories
   1. Air blast cleaning system
   2. Junction box for extension cables. Must be used for lengths greater than 100 meters. C. Extension cables
   3. ModBUS® RS-232 or RS-485 digital output card
   4. Mounting hardware
   5. pH buffer solutions

PART 3 EXECUTION

3.01 PREPARATION

A. The sensor must be mounted to a Hach mounting assembly directly in the solution to be measured.

B. Mount sensor vertically with electrode pointing down. a minimum of 15 degrees above horizontal is allowed.

3.02 INSTALLATION

A. Contractor will install the analyzer in strict accordance with the manufacturer’s instructions and recommendation.

B. Manufacturer's representative will include a half-day of start-up service by a factory-trained technician, if requested.
   1. Contractor will schedule a date and time for start-up.
   2. Contractor will require the following people to be present during the start-up procedure.
      a. Contractor
      b. Electrical contractor
      c. Hach Company factory trained representative
      d. Owner's personnel
      e. Owner's Representative

END OF SECTION

SECTION 15284

PROCESS - CHLORINE RESIDUAL MEASUREMENT EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Chlorine Analyzer for monitoring free residual chlorine.

1.02 MEASUREMENT PROCEDURES

A. The method of measuring free or total chlorine will be with colorimetric chemistry.
   1. The chemistry will be USEPA accepted N,N-diethyl-p-phenylenediamine (DPD) method.

1.03 ALTERNATES

A. A. Other methods of chlorine measurement, such as amperometric, potentiometric, and iodometric with electrodes, are not acceptable.

1.04 SYSTEM DESCRIPTION

A. Performance Requirements
   1. Measurement range: 0 to 5 mg/L (ppm) free or total residual chlorine.
   2. Accuracy: ± 5 percent of reading or ± 0.03 mg/L (ppm), whichever is greater.
   3. Precision: 3% of reading or 0.01 mg/L (ppm), whichever is greater.
   4. Minimum detection limit: 0.03 mg/L (ppm)
   5. Resolution: 0.01 mg/L (ppm)
   6. Repeatability: 0.05 mg/L (ppm)
   7. Cycle time: 2.5 minutes

1.05 CERTIFICATIONS

A. CE approved

B. ETL listed to UL 1262

C. ETL certified to CSA 22.2 No. 142

1.06 ENVIRONMENTAL REQUIREMENTS

A. Operational Criteria
   1. Sample flow rate: 200 to 500 mL/minute
   2. Sample pressure: 1 to 5 psig
      a. The supplied conditioning kit allows for up to 120 psig.
   3. Sample temperature: 5 to 40 degrees C
   4. Operating temperature: 0 to 40 degrees C
   5. Operating humidity: 90 percent at 40 degrees C maximum

1.07 WARRANTY

A. The product includes a one-year warranty from the date of substantial completion.

1.08 MAINTENANCE SERVICE

A. Scheduled maintenance:
   1. Reagent replenishment: monthly, approximately 15 minutes per month
   2. Pump tubing replacement: operating temperature dependent
      a. Below 80 degrees F: six-month intervals
      b. Above 80 degrees F: three-month intervals
   3. Analyzer tubing replacement: annually

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Hach Company, Loveland, CO
   1. Model CL17 Chlorine Analyzer, Free Residual, PN 5440001

2.02 MANUFACTURED UNIT

A. The CL17 Chlorine Analyzer consists of a sample valve, flow cell, and buffer and indicator solutions.

B. The CL17 is housed in a NEMA 12 enclosure, IP62-rated with the gasketed door latched.

2.03 EQUIPMENT

A. The CL17 operates using 115 or 230 volt selectable AC power.

B. Between analysis points, the CL17 performs a self-test auto-blanking to eliminate potential drift.

C. The CL17 operates unattended 30 days between chemical reagent changes and sample cell cleaning.

D. The CL17 has two feed control operation modes to operate chemical feed pumps.
   1. 1. On/off control where the concentration alarm outputs turn the pump on or off when chlorine levels fall below or exceeds acceptable levels.
   2. 2. Proportional control where the 4-20 milli-amp output current is scaled to pace the feed pump proportional to the output.

E. Output
   1. Standard optically isolated analog output, selectable as 0 to 20 milli-amp or 4 to 20 milli-amp, field programmable over any portion of the analyzer range.
   2. Standard two internal alarms, each are SPDT relays with contacts rated for 5 amp resistive load at 230 volt AC power. Alarms include:
      a. Concentration set point
      b. Analyzer system warning
      c. Analyzer system shut down

2.04 COMPONENTS

A. Standard equipment:
   1. Analyzer
   2. One-month supply reagents
   3. Spare pump tubing
   4. Wall mount kit
   5. Sample conditioning kit
   6. Manual

B. Dimensions
   1. 13.5 inches wide (343 mm)
   2. 17.9 inches high (455 mm)
   3. 7 inches deep (178 mm)

C. Weight: 25 pounds (11.3 kg)

D. The CL17 includes a standard sample conditioning element consisting of a pressure regulator, strainer, and shut-off valve.

E. Connectors:
   1. 1. Sample inlet quick-connect 0.25-inch O.D. polyethylene tubing
   2. 2. Sample drain 0.50-inch I.D. flexible tubing
   3. 3. Overflow drain 0.50-inch I.D. flexible tubing
   4. 4. Air purge quick-connect 0.25-inch O.D. polyethylene tubing (optional)

2.05 ACCESSORIES

A. Power cord (PN 5448800)

B. Maintenance kit with pre-assembled tubing (PN 5444301)

C. 1 year reagent supply (PN 2556900 qty 11)

D. Pocket Colorimeter II for free & total chlorine, low and high range combination unit (PN 5870000)

PART 3 EXECUTION

3.01 PREPARATION

A. WALL MOUNT

B. CLEARANCES
   1. Horizontal: 15.2 inches (386 mm) minimum, 27 inches (686 mm) ideal
   2. Vertical: 19 inches (483 mm)
   3. Depth: 20 inches (508 mm)

C. Power connection is made by three-wire barrier terminal block through 0.5-inch conduit hole in case using 12 to 18 AWG.

3.02 INSTALLATION

A. Contractor will install the analyzer in strict accordance with the manufacturer's instructions and recommendation.

B. Manufacturer's representative will include a half-day of start-up service by a factory-trained technician, if requested.
   1. Contractor will schedule a date and time for start-up.
   2. Contractor will require the following people to be present during the start-up procedure.
      a. Contractor
      b. Electrical contractor
      c. Hach Company factory trained representative
      d. Owner's personnel
      e. Owner's representative

END OF SECTION

SECTION 15285
PROCESS - MAGNETIC FLOW METERS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish, test, install and place in satisfactory operation the magnetic flow meters, with all spare parts, accessories, and appurtenances as herein specified and as shown on the Drawings.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Control and Information System Scope and General Requirements

B. Powered Instruments, General

1.03 TOOLS, SUPPLIES AND SPARE PARTS

A. Furnish one portable primary head simulator for calibration and testing of magnetic flowmeter signal converters. The calibrator shall be furnished complete with rechargeable battery pack, test leads, spare battery pack, charger, carrying case and accessories. Calibrator shall be furnished by the flowmeter manufacturer, and shall be fully matched to the instrumentation furnished.

PART 2 -- PRODUCTS

2.01 MAGNETIC FLOW METER SYSTEMS

A. Magnetic flow meter systems shall include a magnetic flow tube and a microprocessor-based "smart" transmitter that is capable of converting and transmitting a signal from the flow tube. Magnetic flow meters shall utilize the characterized field principle of electromagnetic induction, and shall produce DC signals directly proportional to the liquid flow rate.

B. Each meter shall be furnished with a stainless steel or carbon steel metering tube and carbon steel flanges with a polyurethane, ceramic, neoprene, or Teflon liner as required by the application and/or as specified herein. Liner shall have a minimum thickness of 0.125 inches. The inside diameter of the liner shall be within 0.125 inches of the inside diameter of the adjoining pipe. Liner protectors shall be provided on all flow tubes.

C. The flow tube shall be provided with flush mounted electrodes. Ultrasonic electrode cleaning shall not be acceptable.

D. Grounding rings shall be provided for all meters.

E. All materials of construction for metallic wetted parts (electrodes, grounding rings, etc.) shall be minimum 316 stainless steel, but shall be compatible with the process fluid for each meter in accordance with the recommendations of the manufacturer.

F. Flow tube shall be rated for pressures up to 1.1 times the flange rating of adjacent piping. System shall be rated for ambient temperatures of -30 to +65° C. Meter and transmitter housings shall meet NEMA 4X requirements as a minimum. When meter and transmitter are located in classified explosion hazard areas, the meter and transmitter housings shall be selected with rating to meet the requirements for use in those areas. Non-metallic transmitter housings shall not be acceptable.

G. The transmitter shall provide pulsed DC coil drive current to the flow tube and shall convert the returning signal to a linear, isolated 4-20 mA DC signal. The transmitter shall utilize "smart" electronics and shall contain automatic, continuous zero correction, signal processing routines for noise rejection, and an integral LCD readout capable of displaying flow rate and totalized flow. The transmitter shall continuously run self-diagnostic routines and report errors via English language messages.

H. The transmitter's preamplifier input impedance shall be a minimum of 109-1011 ohms which shall make the system suited for the amplification of low-level input signals and capable of operation with a material build up on the electrodes.

I. The transmitter shall provide an automatic low flow cutoff below a user configurable low flow condition (0-10%). The transmitter's outputs shall also be capable of being forced to zero by an external contact operation.

J. Each flow tube shall be factory calibrated and assigned a calibration constant or factor to be entered into the associated transmitter as part of the meter configuration parameters. Manual calibration of the flow meter shall not be required. Meter configuration parameters shall be stored in non-volatile memory in the transmitter. An output hold feature shall be provided to maintain a constant output during configuration changes.

K. The transmitter shall be capable of communicating digitally with a remote configuration device via a frequency-shift-keyed, high frequency signal superimposed on the 4-20 mA output signal. The remote configuration device shall be capable of being placed anywhere in the 4-20 mA output loop. A security lockout feature shall be provided to prevent unauthorized modification of configuration parameters.

L. Accuracy shall be 0.50% of rate over the flow velocity range of 1 to 30ft/sec. Optional.25% of rate accuracy available. Repeatability shall be 0.1% of rate; minimum turndown shall be 100:1. Minimum required liquid conductivity shall not be greater than 5 uS/cm. Maximum response time shall be adjustable between 1 and 100 seconds as a minimum. Transmitter ambient temperature operating limits shall be -10 to +50° C. Power supply shall be 115 VAC, 60 Hz.

M. The transmitter shall be furnished with licensed option for continuous flow meter and system verification and shall be activated as required by the specification or instruments list. The meter verification function shall be internal to the transmitter continuously comparing the transmitters current signature values with those set to establish a baseline and will provide a alert should meter determine it is operating outside configurable limits.

N. Flow tubes shall be 150-lb carbon steel flange mounted unless otherwise noted. AWWA C207 Table 3 Class D for 30” and larger diameter meters. The cables for interconnecting the meter and transmitter shall be furnished by the manufacturer. Transmitter shall be mounted integrally on flow tube, wall, or 2-inch pipe mounted as shown in the Drawings and/or as specified.

O. Magnetic flow meter systems shall be as manufactured by Rosemount Model 8750WA 32ES T 1 A 1 F T S A 160 S A1 DA1 L1 DW.

PART 3 -- EXECUTION

3.01 REQUIREMENTS

A. Ground magnetic flow meter flow tubes and grounding rings in strict accordance with the manufacturer's recommendations.

B. Refer to the specifications for further requirements.

END OF SECTION

SECTION 15290

PROCESS - CHLORINE GAS CONTAINMENT SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE:
   1. The CONTRACTOR shall provide all labor, materials, tools, equipment, and services as indicated on the Drawings, specified herein or as required to furnish and install the Chlorine gas container containment equipment as a complete functioning system.

B. General:
   1. Drawings show functional features and required external connections. The Drawings may not show all components required toaccomplish the desired results or all components required to interface with the equipment. All parts, equipment, and devices necessary to meet the functional requirements shall be provided.
   2. Drawings show a general arrangement of Chlorine gas container containment equipment, connected piping and valves. Drawings are not intended to show exact dimensions peculiar to any specific chlorine gas container containment equipment. Dimensions of the equipment, equipment bases and connected piping shown, may have to be revised in order to accommodate the chlorine gas container containment system provided.
   3. The CONTRACTOR shall be responsible for removing and relocating the existing equipment or piping or structures as shown on the Drawings, and storing or disposing of materials in an OWNER selected location to the satisfaction of the OWNER.
   4. All equipment provided under this Specification shall be furnished by a single supplier or manufacturer who shall assume full responsibility for the completeness of the system. The single supplier or manufacturer shall guarantee and be the source of information on all equipment regardless of the manufacturing source of that equipment.

1.02 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

   Equipment shall be the standard product in regular production by manufacturers of Chlorine gas container containment equipment and shall essentially duplicate equipment that has been in satisfactory operation at least five (5) installations for a period of at least five (5) years.

B. Source Quality Control
   1. The manufacturer shall use only equipment, which is compatible in function, arrangement, reliability and accuracy and will perform in the modes of operation outlined herein. The CONTRACTOR shall require all equipment listed in this Specification to be furnished or coordinated through a single Chlorine gas container containment equipment manufacturer.
   2. The manufacturer shall furnish equipment for which the controls shall meet the requirements as specified herein.

C. Reference Standards

   Comply with applicable provisions and recommendations of the following,
   1. Welding shall be in accordance with ASME Code Section IX using any of the following welding procedures:
      a. SMAW P1-B1.
      b. GTAW/SMAW P1-42-1A.
      c. SMAW/SAW P1-1A.
      d. GTAW P1-1A.
      e. FCAW P1-1 ¾ (for non-pressure welds only).
   2. All completed welds shall be visually inspected.
   3. Spot radiograph welds per UW-52 of ASME Code Section VIII, Div I. One increment of weld shall include a junction.

4. After fabrication, but prior to application of coatings, each tank shall be hydrostatically tested in accordance with ASME Code. Tanks shall be hydrostatically tested at the factory to 375 psig per UG99.
5. Fabrications shall be in accordance with ASME Code Section VIII, Div. I.
6. Design pressure shall be equal to 250 psig at 300 degrees Fahrenheit; minimum design metal pressure (MDMT) equals -20 degrees Fahrenheit at 250 psig; 1/16" corrosion allowance provided; service chlorine containment.
7. Nameplates and Code Stamps: Each containment vessel shall bear a stainless steel ASME nameplate. Each nameplate shall bear the applicable code symbol. Manufacturer shall be authorized by ASME to apply the applicable code symbols.

1.03 SYSTEM DESCRIPTION

A. The chlorine gas container containment system consists of steel containment vessel for containing a single one-ton chlorine gas container. The gas container is sealed within the containment system using a Viton O-ring, 2-bolt chain drive manual door. The containment vessel includes a fail-safe valve that is operated by nitrogen gas and electrical power, nitrogen gas supply to fail-safe actuator, vessel weighing system with electronic weight indication, rollers (in vessel interior), pressure relief valve, vacuum/pressure gauge, interior chlorine supply flex hose, halogenated lubricant, pivots, valves, piping and fittings, container loading system, and manufacturer's on- site consultation and training services.

1.04 SUBMITTALS

A. The equipment manufacturer shall:
   1. Submit Shop Drawings showing the layout and dimensional data of all equipment furnished, fabrication assembly, and the configuration. The layouts and dimensions given on the Drawings are a guide only and may be modified to suit the equipment furnished. Drawings shall include containment vessel dimensions, wall thickness, mounting, and anchorage requirements.
   2. Submit data on capacity, weight, and material, and coating of each item of equipment.
   3. Submit detailed drawings or manufacturer's literature to indicate compliance with specified requirements.
   4. Submit certification and ASME code data reports in accordance with ASME code and, as applicable, 49 CFR 178.337 or other similar codes. The certification shall include certification of hydrostatic testing. Equipment shall not be shipped until vessel has passed hydrostatic testing.
   5. Provide documentation that the manufacturer has produced, supplied and placed into satisfactory service, equipment similar to that specified herein. Criteria shall be a minimum of five (5) installations in service for a minimum of five (5) years.
   6. No equipment shall be shipped until the Shop Drawings are approved.

B. Operation and Maintenance Manuals:
   1. Submit complete installation, operation and maintenance manuals including copies of all approved Shop Drawings, test reports, maintenance data and schedules, description of operation and spare parts information.
   2. Furnish operation and maintenance manuals in conformance with therequirements of Section ????Operation and Maintenance Data.

1.05 DELIVERY, STORAGE AND HANDLING

A. If the OWNER determines that damaged equipment can be repaired at the site, all repairs shall be made by the manufacturer or in accordance with the manufacturer's instructions and under his supervision. Repairs made shall be subject to the approval of the OWNER at the CONTRACTOR'S expense.

B. Damaged equipment rejected by the OWNER shall be removed from the site by the CONTRACTOR.

C. The CONTRACTOR shall comply with the manufacturer's recommendations in handling and storing equipment. Store all equipment to permit easy access for inspection and identification.

1.06 SEQUENCING AND SCHEDULING

A. The CONTRACTOR shall coordinate with the manufacturer of the Chlorine gas container containment system equipment for the proper location of the system.

PART 2 - PRODUCTS

2.01 DESCRIPTION

A. The Chlorine gas container containment equipment will be utilized for secondary containment of a single one-ton chlorine gas container.

B. All components shall be selected for safe reliable operation. Components, and the system as a whole, shall conform to the suggested requirements of The Chlorine Institute.

C. All components exposed to Chlorine liquid, Chlorine solution, or Chlorine gas shall be entirely suitable for the service.

D. All electronic components, panels and switches in the chlorinator room shall be encapsulated or otherwise protected by NEMA 4 enclosures.

2.02 CHLORINE GAS CONTAINER CONTAINMENT SYSTEM AND CONTAINER LOADER SYSTEM

A. Provide the following acceptable Manufacturers:
   1. TGO Technologies.
   2. Or equal.

B. General Description:
   1. Each container containment system shall consist of a 40-inch diameter containment vessel for a single one-ton chlorine container. The chlorine gas containment system shall be designed to operate with a vacuum-operated solution feed system (provided by others). Containment vessel shall include a nitrogen gas/electrically operated fail-safe valve, nitrogen gas supply and fail safe actuator, 120 VAC electrical connection to fail safe actuator, interior vessel rollers, pressure relief valve, vacuum/pressure gauge, pressure supply flex hose (interior), valves, piping and fitting accessories, weighing system, and manufacturers on-site consultation services. A container loading system shall be provided.

C. Containment Vessel:
   1. A single one-ton chlorine gas container containment system vessel shall be of carbon steel construction with design pressure equal to 250 psig at 300 degrees Fahrenheit. Vessel fabrication shall be fabricated in accordance with ASME Code Section VIII, Div. I.
   2. Each containment vessel shall bear a stainless steel ASME nameplate. Each nameplate shall bear the applicable code symbol. Vessel manufacturer shall be authorized by ASME to apply applicable code symbols.
   3. All vessel welding shall be in accordance with ASME Code Section IX using any of the following welding procedures: SMAW P1-B1, GTAW/SMAW P1-42-1A, SMAW/SAW P1-1A, GTAW P1-1A, FCAW P1-1 ¾ (for non-pressure welds only). All welds shall be visually inspected.
   4. Each containment vessel shall be tested in accordance with ASME after fabrication and prior to coating. Completed vessels shall be hydrostatically tested to 375 psig at the factory per UG99.
   5. Coat machined surfaces with rust preventative compound. Each containment vessel interior shall be sandblasted to SSPC-SP-10 and then coated to 2.5 to 3.0 Mils DFT with Carbonzinc 11 HS (inorganic zinc primer). The vessel exterior shall also be blast cleaned to SSPC-SP-6, then prime coated to 4 to 6 Mils DFT with Ameron 385 Epoxy (Red), or equal. Finish coat exterior with Devoe Coatings Devthane 379 Polyurethane, or equal to 2 Mils DFT, Color: BL-6 (OSHA Safety Blue).
   6. Vessel door design shall be chain driven horizontal double bolt door design closure. Door O-ring shall be provided. O-ring material shall be Viton.
   7. Container holding bay within vessel shall be provided with interior rollers, Force Flow Model 21L Roller Trunnions or equal.
   8. Mount bosset connections into interior of vessel. Bosset locations are provided for one primary chlorine gas draw point and one alternative chlorine gas draw point. Provide ton

container valve for each bosset connection. Ton valves shall be Sherwood Type 1214 X1-B1-ton container valves, or equal. Body material shall be Aluminum Silicon Bronze Alloy B, and the stem material shall be Monel.

9. Provide two threaded elbow-coupling manual connections welded into interior of vessel. One connection shall be provided for pressure check and other connector shall be provided for vacuum/pressure gauge. Provide a ton container valve for each elbow coupling connection. Ton valves shall be Sherwood Type 1214 X1-B1-ton container valves, or equal. Body material shall be Aluminum Silicon Bronze Alloy B, and the stem material shall be Monel.
10. Provide coupling connection into interior of vessel for pressure relief valve.
11. Provide necessary fittings compatible with Chlorine service to accomplish connection of valves, switches and gauges to containment vessel.

D. Vessel Interior Chlorine Transfer Hose:
   1. Provide one (1) Chlorine transfer hose within interior of each containment vessel. Transfer hose shall be corrugated Monel 400 with stainless steel guard cover.
   2. Each transfer hose shall be gas pressure tested at a minimum of 750 psig.
   3. Each transfer hose shall be ¼ in. I.D. x 38 in. in length with ¼ in. MNPT ends.
   4. Provide one roll of Teflon tape, Yoke Adaptor #5888-D-1/2-1/4 NPT, Yoke assembly #U1953 ASSY 628, ½ x ¼ in.-3000 lb. threaded 90 degree Monel 400 elbow for each transfer hose.

E. Vessel Pressure Relief Valve:
   1. Provide one pressure relief valve per containment vessel. Valve shall be connected to containment vessel interior.
   2. Valve size shall be 3/4 inch MNPT inlet, 1 inch FNPT outlet.
   3. Materials for valve shall be Teflon Seat, Carbon Steel Container, Monel Base, Monel Disc, Monel Insert, Monel Disc Holder, Monel Guide, and Inconel X750 Steel spring.
   4. Valve shall be Crosby 900 Omni Trim Valve Model No. 951631 MA Inconel X750 Spring or equal. Set to 225 psig.

F. Vessel Vacuum/Pressure Gauge:
   1. Pressure/vacuum gauge and diaphragm shall be Ashcroft, 3.5 inch dial, 30 inch vacuum, 100 psi pressure range, diaphragm protected (Viton), ¼ inch threaded with Monel 400 nipple, gauge type #35-1009AW-02L-30/100 or equal, diaphragm type W/25-310UH-02T or equal, Halocarbon fill. Provide appropriate connectors to connection of gauge to vessel interior elbow connector.

G. Container Loading System:
   1. Provide one chlorine gas container loader manufactured by TGO technologies or equal.

H. Fail-Safe Actuator and Valve Systems:
   1. Fail-Safe actuator and valve system shall consist of an electro-pneumatic actuated ball valve with nitrogen supply system. One fail-safe actuator and valve system shall be provided for each containment vessel. One backup manually operated valve system shall be provided for each containment vessel.
   2. Failsafe assembly shall consist of Actuator: Jamesbury VPVL051SR6 or equal Limit Switch: Stonel Quartz QN33C02SRA-TGO-02 or equal and, Solenoid Valve Asco EF8320G714/120V or equal; Ball Valve: Jamesbury 4CBC-7173XTB-2 or equal, ½ inch, Monel body, Hastalloy ball, Teflon seats, chlorine cleaned.
   3. Backup manual valve shall be ½ inch, Monel body, Hastalloy ball, Teflon seats, chlorine cleaned.
   4. Nitrogen system for pneumatic operation of each fail-safe valve system shall consist of: One (1) 55 cf.. high pressure nitrogen gas cylinder. One (1) Harris 25-80P-580 or equal pressure regulator. One (1) pigtail assembly of ¼ inch - 1500 psi, 72 inch long Teflon tube with braided stainless steel covering, with (1) safety relief valve.

2.03 CHLORINE WEIGHT SCALES

A. Product and Manufacturer: Provide one of the following:
   1. Force-Flow.
   2. Or equal.

B. Features:
   1. Units required: One weigh scale system sized and designed for each Chlorine gas container containment system and associated single one-ton gas container.
   2. Model: Wizard 4000 Electronic Scale
   3. Each chlorine weighing scale system furnished shall be of such a size that it is within the dimensions of the equipment (gas container containment system and single one-ton chlorine gas container) it supports.
   4. Digital readout shall be of the dual display type and shall have the capability to display net, gross, and tare values. Readout shall be equipped with a digital keyboard for easy entry of tare values.
   5. The weight indicator for each scale shall be provided with a weight transmitter 4-20 mADC teed into the dial for remote signal transmission of scale contents (chlorine weight).

2.04 PAINTING

A. Unless specified elsewhere, all ferrous metal surfaces shall be blast cleaned in accordance with SSPC-SP10, shop primed and painted in accordance with the requirements of Division 9, Finishes. Pipe painting shall also be in accordance with the requirements of Division 9, Finishes. If any damage to the paint system occurs, the equipment shall be repainted as directed by the OWNER.

2.05 ANCHOR BOLTS

A. Anchor bolts and nuts shall be of ample size and strength for the purpose intended and sized by the equipment manufacturer, using methods designed to transfer the full, ultimate strength of the anchor bolt to the concrete foundation. See TGO Technologies, Inc installation instructions for size recommendations.

2.06 SPARE PARTS

A. The equipment shall be furnished with the following spare parts, which shall include as a minimum the following:

One (1) Viton O-ring.
One (1) Chlorine transfer hose. One (1) Yoke.
One (1) Yoke adaptor.
One (1) Twisted chlorine wrenches.
One (1) One-half inch valve rebuild kit.
Six (6) Vessel closure locking nut gaskets. One (1) 1 lb. Container 25-5S Grease.
One (1) Pressure/vacuum gauge 30/100. One (1) CGA fitting.
One (1) 55-lb Nitrogen container- filled.
One (1) Nitrogen pigtail assembly with fitting. One (1) Leak test assembly w/chlorine ton valve One (1) Uniweld (testing) nitrogen regulator
One (1) Nitrogen Safety Relief Valve
Eight (8) Teflon Packing

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation of all equipment shall be in complete accordance with the manufacturer's instructions and recommendations and the approved Shop Drawings.

B. Equipment shall be set on concrete bases, secured with anchor bolts and grouted with no shrink grout conforming to Division 3, Concrete.

3.02 START-UP AND TEST

A. All equipment shall be operationally tested by the CONTRACTOR at the job site following installation of the equipment, controls, valves and piping. Should the tests indicate any malfunction, the CONTRACTOR shall make all necessary repairs and/or adjustments. Tests and adjustments shall be repeated until, in the opinion of the OWNER, the installation is complete and the equipment is functioning properly and accurately, and is ready for permanent, continuous operation.

3.03 MANUFACTURER'S SERVICES

A. A manufacturer's representative shall be provided for checking the completed installation, system testing, operation and maintenance personnel training services, during a single four (4) day period, including travel.

B. All costs, including travel, lodging, meals and incidentals shall be included.

END OF SECTION

SECTION 15300

AUTOMATIC FIRE PROTECTION SPRINKLER SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wet Pipe Sprinkler System.

B. Fire Department Connections.

C. System Design, Materials, Installation, and Certification.

D. System Supervision Alarms.

1.02 SCOPE DESCRIPTION

A. Provide a complete automatic fire sprinkler system, hydraulically calculated to protect the entire facility, complete and in operating order. This fire protection system shall be in compliance with the contract documents, applicable codes and standards, as well as the Authority having jurisdiction, as defined in NFPA 13. Sprinklers shall be installed throughout the building as required by NFPA 13, including outside roof canopies, attic areas, crawlspaces, and underfloor areas, utilizing systems compatible with the specific application.

1.03 SPECIAL REQUIREMENTS

A. Provide complete interface with electrical/transformer rooms and areas in compliance with the NEC. Apply the following practices:
   1. Route no piping through electrical rooms with the following exceptions:
      a. Branch piping supplying sprinklers protecting the electrical room. Note: This branch piping shall not exit the electrical room to supply additional sprinklers outside the room.
   2. No piping shall be routed above electrical panels in compliance with the NEC.
   3. Baffles, as described in NFPA 13, shall be provided to prevent direct sprinkler discharge onto electrical panels.

B. Provide complete interface with building smoke and fire alarm system.

C. Provide valve supervision and water flow alarms and trouble signal monitoring system and shall automatically transmit to an approved station in accordance with Uniform Fire Code Section.

1.04 CODES AND STANDARDS

A. IBC Latest Adopted Edition

B. NEC Latest Adopted Edition

C. UPC Latest Adopted Edition

D. IMC Latest Adopted Edition

E. IFC Latest Adopted Edition

F. NFPA 13 Standard for the Installation of Sprinkler Systems, latest edition.

G. NFPA 15 Water Fixed Spray Systems for Fire Protection, latest edition.

H. NFPA 24 Private Fire Service Mains and their Appurtenances, latest edition.

I. NFPA 25 Water-Based Fire Protection Systems, latest edition.

J. NFPA 231 General Storage, latest edition.

1.05 RELATED WORK

A. Division 2, Sitework.

B. Section 15050, Basic Mechanical Materials and Methods.

C. Section 16724, Addressable Fire Alarm and Smoke Detection Systems

1.06 references

A. AWWA C510 Backflow Prevention Devices reduced pressure type and double check valve type.

B. USC University of Southern California: Foundation for Cross-connection Control and Hydraulic Research.

1.07 QUALITY ASSURANCE

A. Unless otherwise noted, this is substantially a "performance" specification.

B. Minimum qualifications of the contractor/subcontractor shall include the following:
   1. Specialist Firm: Company specializing in automatic fire protection/sprinkler systems, possessing a minimum of three years experience with systems similar in nature to the type specified herein.
   2. Design Certification: Shop drawings shall be prepared by a person with a minimum certification of level II designer, supervised by a Licensed Professional Engineer or a level III or IV Fire Sprinkler Designer, certified by the National Institute For Certification In Engineering Technologies (NICET), in Fire Protection Engineering Technology Automatic Fire Sprinkler System Layout.
   3. Equipment and components: Bear the "UL" label or the "FM" approval marking.
   4. Maintain a complete stock of replacement parts.
   5. Remain on 24 hour call for emergency service.
   6. Maintain an office and telephone, with authorized representatives of the Fire Protection Contractor's firm, including the Designated Project Mechanical Sprinkler Supervisor, with a physical presence and address in Alaska.
   7. Bids of wholesalers, contractor or any firm whose principal business is not that of manufacturing and/or installing fire protection systems is not acceptable.

C. Backflow Prevention: Installation and testing by a certified backflow assembly tester, in accordance with the Uniform Plumbing Code (UPC).

1.08 SUBMITTALS

A. Submit under provisions of Division 1.

B. Submit contractors qualifications, proof of 3 years experience under this contractor's firm name, and references for at least 5 projects in Alaska of similar type, size, and complexity.

C. Submit a copy of designer's NICET certification and resume', or Alaska P.E. license number.

D. Submit adequate number of State of Alaska and City of Unalaska Fire Marshal approved sets of shop drawings, and hydraulic calculations to the Architect/Engineer for their review. Engineer will retain 1 set of "stamped approved" shop drawings. These sets must include the NICET certification or stamp of a licensed professional engineer as described above.

E. Submit backflow assembly tester UPC certificate. Submit letter of certification for installation signed by tester.

F. Submit all written reviews and contractor responses to reviews to the Architect/Engineer

G. Submit product data, and sprinkler head layout. Sprinkler head layout shall be reviewed by the Architect/Engineer. All other approvals shall be secured prior to materials fabrication. Additional sprinklers as required shall be added at no additional cost to the contract.

H. Shop Drawings shall include the following information in compliance with NFPA 13:
   1. Name of Owner, occupant and Building Permit Number.
   2. Location, including street address and legal description.
   3. Point of compass.
   4. Fire Department Connections.
   5. All necessary controlling equipment.
   6. Location of water source, type, routing, depth of bury and size of supply piping. Identify location and size of city main and whether it is dead-end or circulating loop, and distance to the flow data test hydrant.
   7. All distribution system piping and outlets. Include pipe and fitting types.
   8. Reflected ceiling plan showing ceiling heights, construction type, proposed location and type of sprinkler heads, and other ceiling devices such as HVAC diffusers, loud speakers, type and location of light fixtures, etc.
   9. Interference control between sprinkler system and other trades.
   10. Full height cross section.
   11. Location of partitions. Identification of full height walls and draft stops.
   12. Location and size of unsprinklered concealed spaces.
   13. Identification of unheated areas.
   14. Water Flow Test Results, include testing agency, time, date and location of test.
   15. Make, model, Type, orifice, finish and Temperature rating of sprinklers and their respective locations.
   16. On systems that are hydraulically calculated, indicate the square footage area protected by each system.
   17. Hydraulic node points.
   18. Make, model, and size of all fire protection control valves, alarm valves, and check valves.
   19. Identify low point drain and inspector test stations.
   20. Indicate the type and location of all piping hangers and equipment supports.
   21. Make, Model, size, and locations of all pipe couplings, fittings and flanges.
   22. Make, model, size, power requirement, and location of alarm bells, buzzers, detectors, and/or alarm panels.
   23. Provisions for flushing.
   24. Name, address and telephone number of the contractor. If design is by a separate firm, include the name address and telephone number of the design facility.
   25. Complete legend of all abbreviations and symbols indicated
   26. Complete schedule of all room occupancies.
   27. Location of all Unit heaters.
   28. Location of all structural penetrations.
   29. Note the location of all "exposed" piping
   30. Valve Supervision Alarm:
      a. Make and model on all supervisory switches, alarm and monitoring panel.
      b. Shop drawing and wire diagram of alarm system.
      c. Location of alarm annunciator, or remote monitoring method to be utilized for off site monitoring.

1.09 MAINTENANCE INFORMATION AND RECORD DRAWINGS

A. Submit under provisions of Division 1.

B. Provide a complete building floor plan showing all system control valves, drain stations, air compressors, alarm and control panels, test valves, and other primary fire protection devices.

Indicate all sprinkler zones, boundaries, and types of systems. Submit this plan prior to substantial completion for review by the mechanical engineer.

C. Include step by step instructions to place the fire protection system in service as well as to take it out of service. Provide complete maintenance information of all primary fire protection equipment, including valves, fittings, sprinklers. Identify equipment indicating whether devices are replacement items or repairable. Provide parts list and suppliers for repairable items. Include complete detailed "Record Drawings" of the fire protection sprinkler system.

D. Provide (1) electronic copy of NFPA 13 and NFPA 25.

E. The contractor shall maintain current and up-to-date "Record Drawings" of the fire protection system at the job site, in accordance with Division 1. Significant changes in piping due to on site coordination with other trades will require recalculation to confirm adequate pipe sizing.

1.10 REVIEWS, APPROVALS, AND PERMITS

A. Obtain written review and/or approval of the entire fire protection system design and arrangement from the following authorities:
   1. Owner's representative - Review
   2. State of Alaska Fire Marshal - Approval
   3. City of Unalaska Fire Marshall - Approval

B. Comply with all review comments, revising the system design as required, and resubmitting in a timely manner, so as not to hinder the construction schedule.

C. Obtain and pay for all required permits, inspections, tests, and approvals as required by authorities having jurisdiction.

1.11 WATER FLOW INFORMATION, HYDRAULIC CALCULATIONS

A. Obtain and verify the water supply Static Pressure, Residual Pressure, at full flow of the test hydrant, at a time of day, during the peak demand on the system, at the point of connection to the water utility system or at a nearby point acceptable to the approval authority. Obtain this data from flow tests or system network design calculations of reliability acceptable to the approval authority. Use this data in flow calculations, and include it with the calculations submittal. Identify the testing agency and the source of the test data.

B. If the contractor conducts the flow test, the test shall be conducted by the designated project Design Supervisor, or Field Superintendent. The contractor shall submit a written procedure and certification for the test, which must be in compliance with NFPA 13 for flow testing water supplies.

C. Hydraulic Calculations shall be accomplished in compliance with the procedures established in NFPA 13. In addition to minimum NFPA 13 standards, a minimum 10% pressure buffer is required to be designed into the system. Where local authorities require additional buffer, the contractor shall comply with the more demanding requirement.

D. Hydraulic Calculations accomplished by computer program for submittal shall be accompanied by a complete legend of the abbreviations, nodes, and symbols utilized on the computer readout.

E. Hydraulic Calculations shall clearly identify the following:
   1. System type, sprinkler "K" factor, and "C" factor.
   2. Pipe and fittings Type.
   3. Fitting Equivalent Length chart which complies with the "C" factor and pipe type.
   4. NFPA hazard designation, Design Density and size of the Design Remote Area.
   5. The Elevation of the "highest" sprinkler.

6. The available water supply and system demand at the point of connection to the water supply, indicated on a logarithmic graph. Include hose demands.
7. Rack Commodity Storage
   a. Commodity Type or class.
   b. Whether the commodity to be stored is encapsulated or not.
   c. Width of aisles between racks.
   d. Rack configuration, i.e. single row, double row, or multirow racks.
   e. Maximum storage height.

1.12 COORDINATION REQUIRED

A. The contractor shall examine the structural, architectural, mechanical, electrical and all other drawings relating to the building and plan his work accordingly. He shall check and verify all dimensions at the site before fabricating any portion of the system. Any discrepancies in piping and head locations resulting from failure to do so shall be corrected expeditiously to provide proper coordination of all trades.

B. Coordinate work with that of other trades to ensure that adequate space is provided for all work, including requirements for serviceability and accessibility. Locate sprinkler heads to avoid conflict with light fixture and other installed equipment.

C. Structural penetrations for piping shall be identified and details of those penetrations shall be submitted to the structural engineer for approval, in a timely manner. Structural members which are damaged cut or penetrated with out approval shall be replaced at no additional expense to the Owner.

D. Sprinklers shall be "centered" in one direction in units of the ceiling suspension system. Adjust the final location of the sprinklers in the field to accomplish these requirements.

1.13 MATERIALS HANDLING AND STORAGE

A. Deliver, store, protect, and handle products to the site under provisions of Division 1. Deliver and store valves in manufacturer packaging with labeling in place. Prior to installation, piping on site shall be wrapped with protective wrapping. Valves, piping, materials, and equipment shall be clean and new when system is accepted by the Owner.

PART 2 PRODUCTS

2.01 GENERAL

A. Provide only new materials and equipment, which are standard products of a manufacturer regularly engaged in the manufacture of fire protection equipment.

B. All products shall bear the "UL" label or "FM" listing and be specifically approved for fire protection application where they are used.

C. Products shall be of domestic origin and manufacture.

2.02 PIPING

A. UL/FM listed schedule 40 galvanized steel.

2.03 GROOVED FITTINGS, COUPLINGS, AND MECHANICAL TEES

A. Grooved Fittings shall be Victaulic, Gruvlok, or equal. Galvanized fittings shall accompany galvanized piping. Couplings and mechanical tees shall be standard painted Victaulic, Gruvlok, or equal.

B. Slip-Fit fittings and couplings utilized for joining branch piping to new main piping shall be "Victaulic" or "Gruvlok" brand as required.

C. Contractor shall follow the manufacturer's suggested methods to prepare, carefully, the ends for these fittings to prevent leakage or system breakdown.

2.04 THREADED PIPE FITTINGS

A. Threaded pipe fitting for this system shall be cast iron 125# ANSI B16.4 malleable iron 150# ANSI B16.3.

2.05 PIPE FLANGES

A. Pipe flanges for this system shall be Cast Iron Class 125# ANSI B16.5.

2.06 PIPING HANGERS AND SUPPORTS

A. Pipe hangers shall conform to NFPA 13 standards.

2.07 ACCEPTABLE MANUFACTURERS FIRE PROTECTION VALVES AND EQUIPMENT

A. Tyco.

B. Central

C. Reliable

D. Grinnell - Gem

E. Star

F. Potter Electric

G. Notifier

H. Kennedy

I. Victaulic

J. Potter Roemer

K. Croker

L. Standard Fire West

M. Milwaukee

2.08 VALVES AND ALARMS ASSEMBLIES

A. Fire Protection Valves
   1. Control Valves: All Fire protection system control valves shall be supervised with switches compatible with the fire alarm system.
      a. OS&Y Gate Valves: Minimum working pressure 175 PSI non-shock cold water. UL listed for fire protection Kennedy or equal.
      b. Butterfly Valves: UL listed for fire protection 175 PSI non-shock cold water, with integrated supervisory switch. Grooved, threaded, or wafer type acceptable. Central model A or equal.
      c. Swing Check Valves: UL listed for fire protection 175 PSI non-shock cold water, cast iron body, stainless steel clapper assembly. Grooved, flanged, or wafer type acceptable. Central Model 90 or equal.

B. Wet Pipe Sprinkler Systems
   1. Alarm Check Valve Assemblies
      a. Provide sprinkler alarm valve assemblies, appropriate to the system, complete with all trimmings and accessories for proper alarm initiation and interface with fire alarm

system. Include inlet and outlet pressure gauges, and main drain with discharge to the outside.

2. Water Flow Detectors
   a. Provide water flow detectors installed at each system or zone control and for the main system header for multiple zone systems. Potter Electric, model VSR-F

C. All electrical alarm and control wiring shall be provided in accordance with Division 16.

2.09 ELECTRIC ALARM

A. Provide (2) electrically operated 10" diameter red gongs. One shall be located on the exterior of the building in an area protected from weather in alcove, and one shall be located within the building.

2.10 FIRE DEPARTMENT CONNECTION

A. Provide 4" connection with two 2-½" female threaded hose connections. Coordinate thread type with local fire department.
   1. All exposed surfaces to be rough chrome.
   2. Connection to be complete with ½" automatic ball drip.
   3. Escutcheon Plate to be labeled AUTO SPRINKLER
   4. Provide 2-½" x 2-½" x 4" Fire Department roof manifold with escutcheon plate at location indicated on the plans.
   5. Provide 2-½"x 2-½" x 4" Fire Department roof manifold with escutcheon plate, Wall Post Indicator and gate valve as indicated on the drawings.

2.11 SPRINKLERS

A. Provide sprinklers as required by NFPA 13 standards and in compliance with the IBC/IFC for the entire project. Sprinkler finish and style as follows:
   1. In all areas with surface mounted light fixtures attached to finished suspended ceilings, provide standard spray pendant sprinklers, and escutcheons to position the sprinkler deflector below the light fixture. Sprinklers and escutcheons to be chrome finish. Central Model "GB", "H" or equal.
   2. In all areas with recessed lighting flush to the suspended ceiling finish, provide recessed standard spray pendant sprinklers. Sprinklers and escutcheons to be chrome finish. Reliable model "G" or equal.
   3. Sprinklers above ceilings and throughout shop and mechanical service areas shall be bronze finish, standard spray, upright or pendant type as required by the drawings.
   4. Sidewall sprinklers shall be bronze finish in all service areas, and chrome through out all public areas.
   5. Dry pendant, sidewall sprinklers protecting inside freezers/coolers or outside overhangs shall be bronze finish. Central model "A-1" recessed or model "H-1". Application of dry type sprinklers shall comply with NFPA 13 standards and are required on all dry pipe systems where the system piping and/or the sprinkler head is located in an unheated area.
   6. Dry pendant sprinklers protecting entry vestibules shall be chrome finish Central model "A-1" recessed. Dry pendant sprinklers protecting unheated areas and piped from wet pipe systems shall have an "A Length" dimension of not less than 18"
   7. Sprinkler Guards shall be of the same manufacturer and finish as the sprinkler which they are to be installed on. Red guards are acceptable for bronze sprinklers only. Chrome finish guards are required for chrome sprinkler heads.
   8. Sprinklers of correct temperature rating shall be installed according to NFPA 13.
   9. Sprinklers for new additions of existing facilities shall match Make, Model, and finish for existing sprinklers, while complying with NFPA 13 standards, provided those sprinklers are still being manufactured.

10. Provide sprinkler wrenches for each type of sprinkler.
11. Spare sprinkler cabinet to be red sheet steel manufactured by the same company that made the sprinklers. Size the cabinet in accordance with NFPA 13 standards. Provide sprinklers for the cabinet representative of the assortment provided for the system. Mount cabinet on the wall within 60" of the sprinkler control riser.

2.12 ACCEPTABLE MANUFACTURERS - BACKFLOW PREVENTERS

A. Watts Regulator.

B. Hersey.

C. Cla-Val.

D. Febco.

E. Substitutions: Under provisions of Division 1.

2.13 BACKFLOW PREVENTERS

A. General: Backflow preventers shall conform to the applicable requirements of AWWA C510. Furnish a certificate of Full Approval or a current Certificate of Approval for each design, size, and make of backflow preventer being provided for the project. The certificate shall be from the Foundation for Cross- Connection Control and Hydraulic Research, University of Southern California, and shall attest that this design, size, and make of backflow preventer has satisfactorily passed the complete sequence of performance testing and evaluation for the respective level of approval. A Certificate of Provisional Approval is not acceptable in lieu of the above. IAPMO (UPC) approved.

B. Double Check Valve Assemblies: ANSI/ASSE 1012; Bronze body (3" and smaller) or FDA approved epoxy coated cast iron body (4" and larger) with bronze or stainless steel internal parts and stainless steel springs; two independently operating check valves with intermediate atmospheric vent with two gate valves and strainer; Series 709 manufactured by Watts.

PART 3 EXECUTION

3.01 CONTRACTOR COORDINATION

A. The fire protection contractor shall coordinate his work with the work of all other trades to assure timely installation and efficient use of mechanical areas including but not limited to boiler rooms, fan rooms, and ceiling spaces.

B. Any work installed without proper coordination shall be promptly removed and reinstalled in a manor to allow for a good practical arrangement of all items which need to be installed by all crafts involved.

C. In case of coordination dispute, the Owner’s representative shall be consulted and his decision shall be binding.

D. All costs associated with coordination and arranging or rearranging of the fire protection system shall be borne by the affected contractor, without causing any additional expense to the Owner.

3.02 PIPING INSTALLATION

A. Install piping to conserve building space and route piping around roof hatches and attic access panels.

B. Install low point drain stations in accordance with NFPA 13 standards. Identify the location of drain and test stations with signs on access panels, ceiling panels, or walls adjacent to the

station, visible from the floor. Discharge all test pipes and system main drain to outside. Coordinate discharge point with Owner's field representative.

C. Provide seismic protection for the piping system in accordance with NFPA 13 standards. Attach bracing to structure with through bolts, washers, and nuts. Provide clearance at all structural penetrations.

D. Dry system piping shall be installed to allow full service and complete drainage of the entire system. All dry piping shall be sloped to accomplish this requirement.

E. Piping shall be concealed in all areas with finished ceilings.

F. Piping concealed in walls shall be secured to studs 48" - 60" above the floor.

G. Pipe penetrations through rated fire walls shall be sealed by a "UL" listed system utilizing fire rated caulking. Submit data under paragraph 1.8 (Submittals) of this specification.

H. When piping is supported from manufactured structural members, the Installation of pipe hangers shall comply with truss manufacturer's recommendations for hanger attachments and loading.

I. When pipe hangers are attached to bar joist with wood top and bottom chords, chords shall be predrilled for fasteners, and fasteners shall maintain a minimum distance of 0'-6" from truss "panel points"

J. Pipe hangers shall be "Rod and Ring" type hangers throughout. Piping hangers shall have a minimum of ½" of adjustment on each side of the hanger ring nut, to allow for piping grade adjustment in the future.

K. All "beam clamp" type fasteners shall be installed with retainer straps and locking nuts.

L. All Trapeze members shall be fastened to truss chords or structural members.

M. Provide isolation mounts for air compressor.

N. Installation of all valves and equipment shall comply with manufacturer's suggested installation practices and directions.

O. Provide service access around all equipment. Comply with codes and standards.

3.03 SYSTEM TEST

A. Hydrostatically test the entire system in accordance with NFPA 13 standards.

B. Test all system alarm actuations and alarms and supervisory valve alarm system.

C. Trip test dry pipe system to confirm system discharge time.

D. 24 hour advanced notice required for all tests to allow Owner's field representative to witness these tests.

3.04 PROJECT CLOSEOUT

A. The fire protection contractor shall submit a written affidavit at the completion of the system, stating that the fire protection system as installed complies with all referenced codes and standards, State Fire Marshal's Office, and the Owner's Insurance Underwriters.

B. Furnish Written Guarantee to the Owner, that materials installations are free from mechanical defects and guaranteeing to replace and repair any and all unsatisfactory and defective work and items, to the satisfaction of the Owner, in a timely manor, for a period of one year after final acceptance of the building by the Owner, and to be responsible for any damage caused to the premises for any such unsatisfactory work.

C. The contractor shall respond with in reasonable time, not to exceed 15 days to repair or replace latent or hidden defects at such time as they are discovered.

D. Minimum one (1) set of "Record Drawings" and maintenance data shall be issued by the contractor to the Owner's designated facility site maintenance engineer, in addition to required submittals. Provide one hard copy and one electronic copy in PDF or DWG format.

E. Contractor shall fully train the Owner's designated maintenance engineer in the operation and maintenance of the entire fire protection system.

END OF SECTION

SECTION 15411

PLUMBING AND HYDRONIC PIPING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Pipe and Pipe Fittings.

B. Valves.

C. Sanitary Sewer Piping System.

D. Domestic Water Piping System.

E. Heating Water Piping System.

1.02 RELATED WORK

A. Section 15190 - Mechanical Identification.

B. Section 15250 - Mechanical Insulation.

C. Section 15430 - Plumbing Specialties.

D. Section 15450 - Plumbing Equipment.

E. Section 15515 - Hydronic Specialties.

1.03 QUALITY ASSURANCE

A. Valves: Manufacturer's name and pressure rating marked on valve body.

1.04 SUBMITTALS

A. Submit product data under provisions of Division 1.

B. Include data on pipe materials, pipe fittings, valves and accessories.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 1.

B. Store and protect products under provisions of Division 1.

C. Deliver and store valves in shipping containers with labeling in place.

PART 2 PRODUCTS

2.01 SANITARY SEWER PIPING, BELOW GRADE

A. ABS Pipe: ASTM D2680 or D2751. Fittings: ABS. Joints: ASTM D2235, solvent weld.

B. PVC Pipe: ASTM D3034. Fittings: PVC. Joints: ASTM D2855, solvent weld, with ASTM D2564 solvent cement.

2.02 SANITARY SEWER PIPING, ABOVE GRADE

A. Cast Iron Pipe: CISPI 301, hubless, service weight. Fittings: Cast iron. Joints: CISPI 310, Neoprene gaskets and stainless steel clamp-and-shield assemblies.

2.03 WATER PIPING

A. Copper Tubing: ASTM B88, Type L, hard drawn. Fittings: ASME B16.18, cast copper alloy, or ASME B16.22, wrought copper. Joints: ASTM B32, solder, Grade 95TA; Flux: ASTM B813.

B. Grooved piping systems are not allowed.

2.04 HEATING WATER AND GLYCOL PIPING

A. Copper Tubing: ASTM B88, Type L, hard drawn.
   1. Fittings: ASME B16.18 cast bronze or ASME B16.22 wrought copper.
   2. Joints: ASTM B32, solder, Grade 95TA or AWS A5.8, BCuP silver braze; Flux: ASTM B813.

2.05 EQUIPMENT DRAINS AND OVERFLOWS

A. ABS Pipe: ASTM D2680 or D2751.
   1. Fittings: ASTM D2751.
   2. Joints: ASTM D2235, solvent weld.

2.06 FLANGES, UNIONS, AND COUPLINGS

A. Pipe Size 2 Inches and Under: 150 psig malleable iron unions for threaded ferrous piping; bronze unions for copper pipe, soldered joints.

B. Pipe Size Over 2 Inches: 150 psig forged steel slip-on flanges for ferrous piping; bronze flanges for copper piping; neoprene gaskets for gas service; preformed neoprene gaskets (no asbestos permitted).

C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.07 ACCEPTABLE MANUFACTURERS - ALL VALVE TYPES

A. Milwaukee.

B. Nibco.

C. Crane.

D. Hammond.

E. Substitutions: Under provisions of Division 1.

2.08 GATE VALVES

A. Not permitted.

2.09 GLOBE VALVES

A. Not permitted.

2.10 BALL VALVES

A. Up to 2 Inches: Class 150, bronze two piece body, full port, forged brass, chrome plated ball, Teflon seats and stuffing box ring, blow-out proof stem, lever handle, solder or threaded ends Seat material to be compatible with fluid handled.

B. Over 2 Inches: Class 150, cast steel, two piece body, full port chrome plated steel ball, Teflon seat and stuffing box seals, lever handle, flanged. Seat material to be compatible with liquid handled.

2.11 SWING CHECK VALVES

A. Up to 2 Inches: Class 125, bronze swing disc, solder or screwed ends.

B. Over 2 Inches: Class 125, iron body, bronze trim, swing disc, renewable disc and seat, flanged ends.

2.12 SPRING LOADED CHECK VALVES

A. Iron body, bronze trim, stainless steel, spring loaded, renewable composition seals, bronze disc, screwed, wafer, or flanged ends.

2.13 WATER PRESSURE REDUCING VALVES

A. Up to 2 Inches: Bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded and single union ends.

B. Over 2 Inches: Cast iron body, bronze fitted, elastomer diaphragm and seat disc, flanged.

2.14 DRAIN VALVES

A. Bronze body, chrome plated brass ball, RPTFE seals and stuffing box ring, stainless steel handle with vinyl cover. 3/4” NPT x 3/4” Hose thread, with duct cover and chain, sweat ends, Apollo 78-100 Series or approved equal.

PART 3 EXECUTION

3.01 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.

D. Verify that excavations are to required grade, dry, and not over excavated.

3.02 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 to conserve building space and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Provide clearance for installation of insulation and access to valves and fittings.

H. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors.

I. Slope water piping and arrange to drain at low points.

J. Install valves with stems upright or horizontal, not inverted.

3.03 APPLICATION

A. Install unions downstream of valves and at equipment or apparatus connections.

B. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

C. Install ball for throttling, bypass, or manual flow control services.

D. Provide spring loaded check valves on discharge of water pumps.

3.04 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Clean, flush and disinfect the potable water piping in accordance with Section 609.9 of the UPC.

B. Submit a written and signed statement to the Owner that the above referenced cleaning procedures have been completed.

3.05 CLEANING OF THE HYDRONIC SYSTEM

A. Prior to starting work, verify system is complete. Thoroughly flush, drain and refill system.

B. Add to the hydronic system, one pound Trisodium Phosphate for each sixty gallons of system capacity.

C. Boil out system for a period of four (4) hours at a minimum temperature of 195º F.

D. Upon completion of boil out, completely flush system and drain all low points. Remove, clean and reinstall strainer baskets.

E. Fill system with glycol.

F. Submit a written and signed statement to the Owner that the above referenced cleaning procedures have been completed.

3.06 TESTING

A. Test all domestic water, heating water, glycol, chilled water, forced main, piping hydrostatically at 100 psig or 150 percent of working pressure, whichever is greater, for a period of 4 hours. Observe piping during this period and repair all leaks.

B. Building Drains, Vents: Cap all openings, fill pipe to the highest opening, observe for no drop in water level for 1 hour. Repair all leaks, if freezing could occur in pipes to be tested, provide air test by forcing air into the system to 5 psi. The pressure must remain for 1 hour without dropping. The gauge must be 0-15 psi maximum, for high resolution.

C. Building Sewer: plug the end of the building sewer at its point of connection, fill the system with water from the lowest to the highest point, and observe for no leaks over one hour. A 5 psi air test for 1 hour is an acceptable alternate if freezing could occur.

D. Provide documentation of all tests performed and any failures or repairs that were made to the system.

END OF SECTION

SECTION 15430

PLUMBING SPECIALTIES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Floor Drains.

B. Trench Drains.

C. Cleanouts.

D. Backflow Preventers.

E. Water Hammer Arrestors.

F. Hose Bibbs Hydrants.

G. Electronic Trap Primer Valves.

1.02 RELATED WORK

A. Section 15411 - Plumbing and Hydronic Piping.

B. Section 15450 - Plumbing Equipment.

1.03 REFERENCES

A. ANSI/ASSE 1012 - Backflow Preventers with Immediate Atmospheric Vent.

B. ANSI/ASSE 1011 - Hose Connection Vacuum Breakers.

C. ANSI/ASSE 1013 - Backflow Preventers, Reduced Pressure Principle.

D. ANSI/ASSE 1019 - Wall Hydrants, Frost Proof Automatic Draining Anti-Backflow Types.

E. ANSI A112.21.1 - Floor Drains.

F. ANSI A112.21.2 - Roof Drains.

G. ANSI A112.26.1 - Water Hammer Arresters.

H. AWWA C510 - Backflow prevention devices - reduced pressure principal and double check valve type.

I. PDI WH-201 Water Hammer Arresters.

J. USC - University of Southern California: Foundation for Cross-connection Control and Hydraulic Research.

1.04 QUALITY ASSURANCE

A. Manufacturer: For each product specified, provide components by same manufacturer throughout.

B. Backflow Prevention: Installation and testing by a certified backflow assembly tester, in accordance with the Uniform Plumbing Code (UPC).

1.05 SUBMITTALS

A. Submit product data under provisions of Division 1.

B. Include component sizes, rough-in requirements, service sizes, and finishes.

C. Submit on the following items:
   1. Drains.
   2. Cleanouts.
   3. Backflow Preventers.
   4. Water hammer arrestors.
   5. Thermostatic mixing valves.
   6. Hose bibb hydrants.

D. Submit backflow assembly tester UPC certificate. Submit letter of certification for installation signed by tester.

1.06 OPERATION AND MAINTENANCE DATA

A. Provide Manufacturer's parts list and maintenance information on specialties.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - FLOOR DRAINS, CLEANOUTS, TRENCH DRAINS, AND ACCESSORIES

A. J.R. Smith.

B. Zurn.

C. Josam.

D. Mifab.

E. Substitutions: Under provisions of Division 1.

2.02 FLOOR DRAINS

A. FD-1 and FD-2: ANSI A112.21.1; lacquered cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer and trap primer connection.

2.03 CLEANOUTS

A. Coated cast iron floor cleanout, internal bronze cleanout plug, adjustable cast iron housing with round nickel bronze scoriated secured top in service areas; Model 4021 manufactured by J.R. Smith.

B. Coated cast iron floor cleanout, internal bronze cleanout plug, adjustable cast iron housing with square nickel bronze scoriated secured top in service areas; Model 4041 manufactured by J.R. Smith.

C. Coated cast iron floor cleanout, internal bronze cleanout plug, adjustable cast iron housing with round nickel bronze depressed cover to accept floor finish in finished floor areas; Model 4141 manufactured by J.R. Smith.

D. Coated cast iron floor cleanout, internal bronze cleanout plug, adjustable cast iron housing with square nickel bronze depressed cover to accept floor finish in finished floor areas; Model 4161 manufactured by J.R. Smith.

E. Interior Finished Wall Areas: Line type with lacquered cast iron body and round epoxy coated gasketed cover, bronze plug, and round stainless steel access cover secured with machine screw; Model 4422 manufactured by J.R. Smith.

F. Interior Unfinished Accessible Areas: Caulked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

2.04 TRENCH DRAINS

A. TD-1 - 96 inch long, 12 inch wide reveal and have a 9-1/4 inch throat modular channel sections made of 0% water absorbent High Density Polyethylene (HDPE). Channels shall have a positive mechanical connection between channel sections that will not separate during the installation and shall mechanically lock into the concrete surround every 12 inches. Channels shall have a smooth, 3 inch radiused self-cleaning bottom. Grates shall be reinforced slotted stainless steel conforming to ASTM specification A351.

B. TD-2 - 2-1/2” Wide Trench Drain System shall be 48 inch long and 2-1/2” wide. Drain shall be 3 inch deep. Drain shall be made of (HDPE) High Density Polyethylene, and shall be UV-10 stabilized. Drain shall have bedding feet to be used for positioning and anchoring purposes. Drain shall have tongue and groove snap fit connection. Drain shall have 24 long high-density polyethylene decorative grate.

2.05 ACCEPTABLE MANUFACTURERS - BACKFLOW PREVENTERS

A. Watts Regulator.

B. Hersey.

C. Febco.

D. Substitutions: Under provisions of Division 1.

2.06 BACKFLOW PREVENTERS

A. General: Backflow preventers shall conform to the applicable requirements of AWWA C510. Furnish a certificate of Full Approval or a current Certificate of Approval for each design, size, and make of backflow preventer being provided for the project. The certificate shall be from the Foundation for Cross- Connection Control and Hydraulic Research, University of Southern California, and shall attest that this design, size, and make of backflow preventer has satisfactorily passed the complete sequence of performance testing and evaluation for the respective level of approval. A Certificate of Provisional Approval is not acceptable in lieu of the above. IAPMO (UPC) approved.

B. Reduced Pressure Backflow Preventers: ANSI/ASSE 1013; FDA approved epoxy coated cast iron (4" or larger) or bronze body (3" or smaller) with bronze and stainless steel internal parts and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve which opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks; Series 909 manufactured by Watts.

C. Double Check Valve Assemblies: ANSI/ASSE 1012; Bronze body (3" and smaller) or FDA approved epoxy coated cast iron body (4" and larger) with bronze or stainless steel internal parts and stainless steel springs; two independently operating check valves with intermediate atmospheric vent with two gate valves and strainer; Series 709 manufactured by Watts.

2.07 ACCEPTABLE MANUFACTURERS - WATER HAMMER ARRESTORS

A. J.R. Smith.

B. Zurn.

C. Josam.

D. Mifab.

E. Substitutions: Under provisions of Division 1.

2.08 WATER HAMMER ARRESTORS

A. ANSI A112.26.1; sized in accordance with PDI WH-201, precharged suitable for operation in temperature range -100 to 300º F and maximum 250 psig working pressure; Series 5000 manufactured by J.R. Smith.

2.09 ACCEPTABLE MANUFACTURERS - HOSE BIBBS/HYDRANTS

A. Woodford.

B. J.R. Smith.

C. Zurn.

D. Josam.

E. Substitutions: Under provisions of Division 1.

2.10 HOSE BIBBS/HYDRANTS

A. Interior Hose Bibb (HB-1): Bronze or brass, replaceable disc, hose thread spout, chrome plated finish, tee handle, with vacuum breaker in conformance with ANSI/ASSE 1011.

B. Exterior Hose Bibb (HB-2): ANSI/ASSE 1019; non-freeze, self-draining type with chrome plated hose thread spout, removable key and vacuum breaker in conformance with ANSI/ASSE 1011.

2.11 ELECTRONIC TRAP PRIMER VALVE

A. Electronic Trap Primer: Prime-time Trap Primer as manufactured by Precision Plumbing Products or equal. Recessed mounted in cabinet NEMA-1 cabinet with cover plate. Provide NEMA-12 cabinet where located in process area. UL listed. Provide manifold with number of connections as indicated on the drawings.

B. Model PT as manufactured by Precision Plumbing Products, Inc. or equal.

2.12 ACCEPTABLE MANUFACTURERS - DIAPHRAGM-TYPE COMPRESSION TANKS

A. Amtrol.

B. Taco.

C. Bell & Gossett.

D. Substitutions: Under provisions of Division 1.

2.13 DIAPHRAGM-TYPE COMPRESSION TANKS

A. Construction: Welded steel with flexible EPDM diaphragm sealed into tank.

B. Accessories: Air-charging fitting, tank drain; pre-charge to city water pressure.

C. Listing: NSF.

PART 3 EXECUTION

3.01 INSTALLATION AND APPLICATION

A. Install specialties in accordance with manufacturer's instructions to permit intended performance.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

C. Encase exterior cleanouts in concrete flush with grade.

D. Install water hammer arrestors complete with accessible isolation valve.

END OF SECTION

SECTION 15440

PLUMBING FIXTURES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Water Closets.

B. Lavatories.

C. Sinks.

D. Showers.

1.02 RELATED WORK

A. Section 15411 – Hydronic and Plumbing Piping.

B. Section 15430 - Plumbing Specialties.

C. Section 15450 - Plumbing Equipment.

1.03 QUALITY ASSURANCE

A. Fixtures: By same manufacturer for each product specified throughout.

B. Trim: By same manufacturer for each product specified throughout.

1.04 SUBMITTALS

A. Submit product data under provisions of Division 1.

B. Include fixtures, sizes, utility sizes, trim, and finishes.

1.05 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Division 1.

B. Include fixture trim exploded view and replacement parts lists.

1.06 WARRANTY

A. Provide manufacturer's warranty under provisions of Division 1.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS –FIXTURES

A. Kohler.

B. American Standard.

C. Fiat.

D. Substitutions: Under provisions of Division 1.

2.02 ACCEPTABLE MANUFACTURERS - FIXTURE TRIM

A. Kohler.

B. Delta.

C. Fiat.

D. Substitutions: Under provisions of Division 1.

2.03 WATER CLOSET – P-1

A. Bowl: ANSI A112.19.2M; floor mounted, siphon jet, vitreous china, 16-1/2 inch high close-coupled closet combination with elongated rim.

B. Tank: vitreous china closet tank with fittings, fill valve with polished chrome trip lever and chrome plated bolt caps, 1.6 gallon flush.

C. Seat: Solid white plastic, elongated open front, extended back, check hinge, brass bolts, without cover.

2.04 LAVATORY – P-2

A. Basin: ANSI A112.19.2M; vitreous china wall-hung lavatory 20-1/4 x 18-1/8 inch, with 4 inch high back, faucet drillings on 4 inch centers, rectangular basin with splash lip and front overflow.

B. Trim: ANSI A112.18.1; Lead free, chrome plated brass, single handle deck mounted faucet, 0.5 GPM vandal resistant aerator, metal grid strainer.

C. Wall Mounted Carrier: ANSI A112.6.1; cast iron and steel frame concealed arm supports, bearing plate and studs; manufactured by J.R. Smith.

2.05 SHOWER STALL – P-3

A. Cabinet: ANSI Z124.2; One-piece acrylic shower stall, 35-7/8 inch x 35” inch x 84” overall dimensions, textured slip resistant bottom, center drain opening.

B. Accessories: Stainless steel curtain rod with commercial grade white vinyl shower curtain with stainless steel curtain hooks, chrome plated metal strainer.

C. Shower Valve: ANSI A112.18.1; Pressure balanced mixing valve assembly with screwdriver stops, adjustable temperature limit stops, integral check stops, metal blade handle with adjustable rotational stop, bent shower arm with escutcheon, fixed 1.5 GPM shower head.

2.06 LAB SINK – P-4

A. Basin: 23 x 21-1/2 x 13 inch high heat molded, self rimming resin basin with one inch wide shoulders for drop in installation, ledgeback soap tray ledgeback drilled for trim, stainless steel strainer with rubber stopper

B. Trim: ANSI A112.18.1.1-2000; chrome plated lead free brass body, 4” centers, 6-1/4” long x 5-1/8” high swing spout with vacuum breaker and 3/4 inch hose thread. Control mechanism shall be of the rotating cylinder type with stainless steel plate and 180° rotation, with replaceable non-metallic seats operating in stainless steel lined sockets.

2.07 P-TRAP

A. P-trap shall be chrome plated cast brass body, with 17 gauge seamless tubular wall bend, cast brass slip nuts. Reducing washers shall be used with reducing cast brass nut**,** chrome plated brass escutcheons.

2.08 ANGLE STOPS AND SUPPLY RISERS

A. Quarter-turn lead free brass ball valve with convertible loose key handle, chrome plated copper, or braided stainless supply risers and chrome plated brass escutcheons.

PART 3 EXECUTION

3.01 INSPECTION

A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

B. Verify adjacent construction is ready to receive rough-in work of this Section.

3.02 INSTALLATION

A. Install each fixture with removable p-trap for servicing and cleaning.

B. Provide angle stop and supply risers at each fixture. Provide chrome plated escutcheons for both hot and cold water supplies and waste piping.

C. Install components level and plumb

D. Install and secure lavatory in place with floor carrier, supports as per the manufacturers instructions.

E. Solidly attach floor mounted water closets to toilet flange with non-corroding t-bolts, washers and acorn nuts.

F. Seal fixtures to wall and floor surfaces with silicone sealant, color to match fixture.

G. Mount fixtures to the following heights above finished floor:

Water Closet:		
ADA	18	inches to top of seat
Lavatory:		
Standard	31	inches to top of basin rim
ADA	34	inches to top of basin rim
Shower Heads:		
Adult	69.5	inches to bottom of head

3.03 ADJUSTING AND CLEANING

A. Adjust stops, valves or flow control valves for intended water flow rate to fixtures without splashing, noise, or overflow.

B. At completion clean plumbing fixtures and equipment.

END OF SECTION

SECTION 15450

PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 WORK INCLUDED

A. Indirect Water Heaters.

B. Domestic Water Circulation Pumps.

C. Pressure Booster System.

1.02 RELATED WORK

A. Section 15050 – Basic Mechanical Materials And Methods.

B. Section 15430 - Plumbing Specialties.

1.03 QUALITY ASSURANCE

A. Provide pumps with manufacturer's name, model number, and rating/capacity identified.

B. Ensure products and installation of specified products are in conformance with recommendations and requirements of the following organizations:
   1. National Sanitation Foundation (NSF).
   2. American Society of Mechanical Engineers (ASME).
   3. National Electrical Manufacturers' Association (NEMA).
   4. Underwriters Laboratories (UL).

1.04 SUBMITTALS

A. Submit product data under provisions of Division 1.

B. Include dimension drawings of indirect water heaters indicating components and connections to other equipment and piping.

C. Include dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tappings, and drains.

D. Indicate pump type, capacity, power requirements.

E. Submit pump curves showing pump performance characteristics with pump and system operating point plotted.

F. Submit manufacturer's installation instructions under provisions of Division 1.

1.05 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Division 1.

B. Include operation, maintenance, and inspection data, replacement part numbers.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 1.

B. Store and protect products under provisions of Division 1.

C. Provide temporary inlet and outlet caps. Maintain caps in Place until installation.

1.07 WARRANTY

A. Provide manufacturer's warranty under provisions of Division 1.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS – INDIRECT WATER HEATERS

A. Bradford White

B. Squire.

C. Triangle Tube.

D. Substitutions: Under provisions of Division 1.

2.02 INDIRECT WATER HEATERS

A. Tank: Heavy gauge steel automatically formed, rolled and welded to assure a continuous seam for glass lining with two (2) replaceable aluminum anode rods.

B. Heat Exchanger: Double wall 1-1/2" O.D. ceramic glass coated steel coil with positive leak path between the two walls of the coil.

C. Insulation: 2" Non-CFC Foam Insulation covering the sides and top of tank.

D. Hydronic Supply and Return Connections: 3/4" NPT female connections are located on the front for both the boiler supply and boiler return.

E. Domestic Water Connections: 3/4" NPT factory installed dielectric fittings with sediment reduction system.

F. Controls: Fully automatic, fast acting surface-mount thermostat for automatic temperature control.

G. Accessories: ASME rated T&P relief valve, low restriction brass drain valve.

2.03 ACCEPTABLE MANUFACTURERS - IN-LINE CIRCULATOR PUMPS

A. Grundfos.

B. Substitutions: Under provisions of Division 1.

2.04 IN-LINE CIRCULATOR PUMPS

A. Casing: Bronze or stainless steel, rated for 125 psig working pressure.

B. Impeller: Bronze.

C. Shaft: Alloy steel with integral thrust collar and two oil lubricated bronze sleeve bearings.

D. Seal: Carbon rotating against a stationary ceramic seat.

2.05 ACCEPTABLE MANUFACTURERS - PRESSURE BOOSTER SYSTEMS

A. Grundfos.

B. Davey.

C. ITT Gould.

D. Substitutions: Under provisions of Division 1.

2.06 PRESSURE BOOSTER SYSTEMS

A. Packaged pump pressure boosting system completely factory assembled, tested, and adjusted; shipped to site as integral unit; consisting of pumps, valves, and galvanized piping, with control panel assembled on fabricated steel base with structural steel framework.

B. Locate controls and instruments in NEMA 1 (NEMA-12 minimum if located in process areas) general-purpose enclosure with main disconnect interlocked with door, fused circuit for each motor, magnetic starters with three overloads, control circuit transformer with fuse protection, selector switch for each pump, low limit pressure switch, low pressure alarm light, running lights, current sensing devices, minimum run timers, manual alternation, and suction and discharge pressure gauges.

C. Low pressure control to stop pump operation if incoming water pressure drops to atmospheric.

D. Provide line sized ball valves on suction and discharge of pump. Provide line sized check valve on pump discharge.

PART 3 EXECUTION

3.01 WATER HEATER INSTALLATION

A. Install indirect water heaters in accordance with manufacturer's instructions.

B. Coordinate with plumbing piping and related work to achieve operating system.

3.02 PUMP INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide line sized ball valve on suction and line sized check valve and ball valve on discharge.

C. Support piping adjacent to pump such that no weight is carried on pump casings.

END OF SECTION

SECTION 15484

FUEL PIPING SYSTEM

PART 1 GENERAL

1.01 WORK INCLUDED

A. Pipe and Pipe Fittings.

B. Valves.

C. Above Ground Fuel Oil Storage Tanks.

D. Fuel Oil Day Tanks.

E. Fuel Systems Specialties

F. Fuel System Equipment.

1.02 RELATED WORK

A. Section 15050 - Basic Mechanical Materials and Methods.

1.03 QUALITY ASSURANCE

A. Valves: Manufacturer's name and pressure rating marked on valve body.

B. Provide pumps with manufacturer's name, model number, and rating/capacity identified.

C. Ensure products and installation of specified products are in conformance with recommendations and requirements of the following organizations:
   1. National Electrical Manufacturers' Association (NEMA).
   2. Underwriters Laboratories (UL).

D. Ensure pumps operate at specified system fluid temperatures without vapor binding.

E. Fuel oil storage tank manufacturers must be a member of Steel Tank Institute, and have 3 years experience.

F. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.

G. Welders Certification: In accordance with ANSI/ASME Sec 9.

H. All fuel tanks, vents and distribution systems are to be installed in accordance with the latest adopted edition of NFPA 31 and the State adopted IFC, UPC and IMC.

1.04 SUBMITTALS

A. Submit product data under provisions of Division 1.

B. Include data on: piping, valves, pumps, dispensers and specialties.

C. Provide manufacturer's installation requirements.

D. Include dimension drawings of pumps and dispenser indicating components and connections to other equipment and piping.

E. Include dimensions of dispenser containment boxes, anchors, attachments, lifting points and tappings.

F. Indicate pump type, capacity, power requirements, and affected adjacent construction.

G. Submit tank shop drawings under provisions of Division 1.

H. Submit, as part of shop drawings for tanks, manufacturer's installation instructions.

I. Submit certified tank tightness test report.

1.05 REGULATORY REQUIREMENTS

A. Conform to manufacturer's UL listing requirements for installation and American Petroleum Institute 1615-Installation of Underground Petroleum Storage Systems.

B. Comply with applicable government regulations.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 1.

B. Store and protect products under provisions of Division 1.

C. Deliver and store valves, specialties, and equipment in shipping containers with labeling in place.

1.07 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Division 1.

B. Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

C. Include exploded view and replacement parts list.

1.08 WARRANTY

A. Provide manufacturer's warranty under provisions of Division 1.

B. Warranty: Include coverage of Dispenser and pumps.

1.09 EXTRA STOCK

A. Furnish to the Owner, two extra fuel dispenser filters.

PART 2 PRODUCTS

2.01 FUEL PIPING, BURIED

A. Primary Piping: Flexworks C075/C10 double wall primary or equal, UL listed.

B. Secondary Piping: Flexworks model APX40 lined access pipe or equal, 4-inch diameter corrugated flexible conduit, H-20 load rated, UL listed.

2.02 FUEL PIPING, ABOVE GROUND

A. Steel Pipe: ASTM A53, Schedule 40 black. Fittings: ANSI/ASTM B16.3, malleable iron, or ASTM A234, steel welding type. Joints: Welded.

2.03 FLANGES, UNIONS, AND COUPLINGS

A. 150 psig malleable iron unions for threaded ferrous piping..

B. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.04 GATE VALVES AND GLOBE VALVES

A. Not permitted.

2.05 BALL VALVES

A. Up to 2 Inches: Bronze body, stainless steel ball, Teflon seats and stuffing box ring, lever handle, solder or threaded ends. Seat material to be compatible with fluid handled.

2.06 VERTICAL CHECK VALVES

A. Valve: All brass parts, precision machined poppets and seats, lapped in with seats, single flat seat and disc construction. Heavy duty hex on both ends.

B. Model A425 as manufactured by Emco-Wheaton.

2.07 RELIEF VALVES

A. Bronze body, Teflon seat, steel stem and springs. Automatic, direct pressure actuated at 60 psi, UL listed for fuel systems, ASME certified and labeled.

2.08 ACCEPTABLE MANUFACTURERS ABOVE- GROUND FUEL STORAGE TANKS

A. Anchorage Tank.

B. Ace Tank.

C. Greer Tank.

D. Substitutions: Under provisions of Division 1.

2.09 ABOVE GRADE FUEL OIL STORAGE TANK

A. Product Description: Aboveground, horizontal, double-wall type I, steel storage tank. Tank shall be fabricated from mild carbon steel with flat-flanged heads. Minimum inner tank thickness 12 gauge head and shell. Minimum outer tank thickness 10 gauge head and shell. The tank shall be manufactured in conformance with Underwriters Laboratories' UL-142 specifications and so labeled.

B. The tank shall be fabricated with threaded connections, with quantity and locations as indicated on drawing. Thread protectors shall be inserted in all threaded openings prior to shipment.

C. The tank shall be The Tank Shall Be Painted With White Polyurethane 5-7 Mils

D. The subject tank shall be warrantied to be free from defects in manufacturing, workmanship and materials. The manufacturer shall repair or replace, at its sole discretion F.O.B. factory, within a period of one year after date of shipment. All other items shall be warranted by their respective manufacturers. Liability hereunder is limited, as stated above, and does not include labor, installation costs, indirect or consequential damages of any kind.

E. Accessories:
   1. Mushroom Vent.
   2. Spill Container.
   3. Overfill Prevention Valve with dry break and dust cap complete with drop tube.
   4. Clock Gauge.
   5. Supply drop tube and single poppet valve.
   6. Primary tank emergency vent
   7. Secondary tank emergency vent.
   8. Anti-siphon valve.
   9. Visual interstitial alarm.

10. IFC compliant Signage.
11. OSHA Ladder and Platform.
12. Analog 4-20mA transducer with connection to local SCADA system.

2.10 ACCEPTABLE MANUFACTURERS - PACKAGED DAY TANK

A. Simplex.

B. No Substitutions.

2.11 PACKAGED DAY TANK

A. Provide complete day tank system incorporating a heavy gauge steel tank, level controls and all accessory components packaged in one system and supplied as a system by a single manufacturer. Factory wired and plumbed. System shall be UL listed.

B. Provide cover for accessory components, test button for components, complete tank interior epoxy coating, rust-proof and painted exterior finish, and tank float switches for alarm and level control.

C. Tank and openings/penetrations shall be rated for minimum of 2.5 psi internal pressure operation.

D. All day tank controller alarms shall be connected to the DDC system.

E. Provide the following accessories:
1. Duplex heavy duty duplex pump set.
2. Simplex return pump set.
3. Fuel-in-vent float switch.
4. Low fuel and high fuel level alarms with relays for remote annunciation.
5. Analog 4-20mA level sensor connected to local DDC system.
6. Pump hand-off-auto switch.
7. Auxiliary piston type hand pump capable of self-priming to 18' of lift.
8. Fluid level indicator.
9. Manual fuel fill cap.
10. Six inch square inspection port.
11. Outer rupture basin with 100% capacity of tank.
12. Rupture basin drain valve.
13. Solenoid valve on pump inlet which closes on high level alarm or loss of power.
14. Tappings as required and tank drain.
15. Pump pressure relief valve for each pump.
16. Wall mounting brackets.

2.12 ACCEPTABLE MANUFACTURER - FUEL FILTERS

A. General

B. Substitutions: In accordance with Division 1.

2.13 FUEL FILTERS

A. Leak-proof iron and steel construction, 12 PSI maximum working pressure.

B. 10 micron wool felt filter.

C. Model 2A-700A as manufactured by General.

2.14 ACCEPTABLE MANUFACTURERS – ELECTROIC TANK MONITORING

A. Veeder-Root

B. Omntec.

C. Substitutions: Under provisions of Division 1.

2.15 ELECTRIC TANK MONITORING

A. RS-232 Communication Interface with Auxiliary Port provides two 25-pin D-connectors for data transmission to computers or point-of-sale terminals.

B. Automatic continuous leak sensing of the tank interstitial space.

C. Audible alarm and display indicate leak.

D. In-tank warnings and alarms are activated for the following conditions:
   1. Leak.
   2. Overfill.
   3. Low Product.
   4. Sudden Loss.
   5. Delivery Needed.
   6. Test Failure.

E. Accepts up to eight interstitial / containment float sensors

F. Interstitial and piping sump warnings and alarms are activated for the following conditions: fuel presence:
   1. Low Liquid.
   2. High Liquid.

G. Two built-in inputs provide for solid-state or switch input from external devices

H. Two built-in output relays provide for outputs to overfill alarms and external audible and visual warning devices, and SCADA system.

I. Model TLS-300C as manufactured by the Veeder-Root Company.

2.16 ACCESSORIES

A. Interstitial Steel Tank Sensor.

B. Magnetostrictive Probe for Inventory Measurement.

C. Site Fax Modem.

D. Ethernet/IP Card.

PART 3 EXECUTION

3.01 PREPARATION - PIPING

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.

3.02 INSTALLATION - PIPING

A. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

B. Route piping in orderly manner and maintain gradient.

C. Install piping to conserve space and not interfere with use of space.

D. Group piping whenever practical at common elevations.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Provide clearance for installation of accessories and access to valves and fittings.

G. Slope piping to drain to tank.

H. Provide anti-siphon valve on top of suction drop tube, Tigerstop as manufactured by Tigerholm

I. Provide vertical poppet check valve on suction drop tube.

J. Extend primary tank vent to a minimum 12 feet above finish grade.

K. Field cut drop tube to length as required to height above bottom of tank shown.

3.03 INSTALLATION - TANK ACCESSORIES

A. Install accessories in accordance with manufacturer's recommendations.

3.04 ELECTROIC TANK MONITORING

A. Install electronic tank monitoring console, sensor, probes and accessories in accordance with manufacturer's recommendations and as indicated by this specification.

3.05 INSTALLATION - DAYTANK

A. Install in accordance with manufacturer's recommendations.

B. Provide interties from daytank controls to remote pumping unit.

C. Extend vent from tank to exterior of building and end a minimum of twelve feet above grade.

END OF SECTION

SECTION 15515

HYDRONIC SPECIALTIES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Expansion Tanks.

B. Air Vents.

C. Air Separators.

D. Strainers.

E. Balance Valves.

1.02 RELATED WORK

A. Section 15411 - Plumbing And Hydronic Piping.

1.03 REFERENCES

A. ANSI/ASME - Boilers and Pressure Vessels Code.

1.04 REGULATORY REQUIREMENTS

A. Conform to ANSI/ASME Boilers and Pressure Vessels Code Section 8D for manufacture of tanks.

1.05 QUALITY ASSURANCE

A. Manufacturer: For each product specified, provide components by same manufacturer throughout.

1.06 SUBMITTALS

A. Submit product data under provisions of Division 1 and Section 15010.

1.07 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Division 1.

B. Include installation instruction, assembly views, lubrication instructions, and replacement parts list.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 1.

B. Store and protect products under provisions of Division 1.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - DIAPHRAGM-TYPE COMPRESSION TANKS

A. Amtrol.

B. Taco.

C. Bell & Gossett.

D. Substitutions: Under provisions of Division 1.

2.02 DIAPHRAGM-TYPE COMPRESSION TANKS

A. Construction: Welded steel with flexible EPDM diaphragm sealed into tank complete with steel saddles.

B. Accessories: Air-charging fitting, tank drain; precharge to 12 psig.

2.03 ACCEPTABLE MANUFACTURERS - AIR VENTS

A. Spriotherm.

B. No substitutions.

2.04 AIR VENTS

A. Float Type: Maintenance free solid brass construction, continuous air venting, 150 psig standard working pressure, 270° F maximum temperature, 1⁄2 inch male tread at vent point for pressure testing or remote venting, 1/2 inch female threaded connections. Spriotop Air Release Valve as manufactured by Spriotherm, Inc.

2.05 ACCEPTABLE MANUFACTURERS - AIR SEPARATORS

A. Spriotherm

B. No substitutions.

2.06 AIR SEPARATORS

A. Construction: Steel body, brass vent head, non-ferrous float, Viton seals and o-rings, copper coalescing medium, 150 PSIG maximum working pressure, 270ºF maximum operating temperature, ASME 150 pound flanged connection. Provide with capped drain valve.

2.07 ACCEPTABLE MANUFACTURERS - STRAINERS

A. Bell & Gossett.

B. Taco.

C. Armstrong.

D. Substitutions: Under provisions of Division 1.

2.08 STRAINERS

A. Screwed brass or iron body for 175 psig working pressure, Y pattern with 1/32 inch stainless steel perforated screen.

2.09 ACCEPTABLE MANUFACTURERS - BALANCE VALVES

A. Armstrong.

B. Taco.

C. Bell & Gossett.

D. Substitutions: Under provisions of Division 1.

2.10 BALANCE VALVES

A. Angle or straight pattern, inside screw globe valve for 125 psig 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.

PART 3 EXECUTION

3.01 INSTALLATION AND APPLICATION

A. Install specialties in accordance with manufacturer's instructions to permit intended performance.

B. Support tanks inside building from building structure, in accordance with manufacturer's instructions.

C. Provide air vents at system high points and as indicated.

D. For automatic air vents, provide vent tubing to nearest drain or back to glycol tank if in mechanical room. Where a drain is not available run discharge to a 12”x12”x6” high galvanized, water tight pan located in an accessible location.

E. Provide air separator on suction side of system circulation pump and connect to expansion tank.

F. Provide valved and capped hose thread connection on strainer blow down connection.

G. Provide shutoff valves on water inlet to terminal heating units such as radiation, unit heaters, and fan coil unit.

H. Provide balancing valves on water outlet from terminal heating units.

I. Clean and flush glycol system before adding glycol solution.

J. Feed glycol solution to system through make-up line with pressure regulator, venting system high points. Set to fill at 12 psig. Pressure system cold at 5 psig, adjust when hot to 12 psig.

K. Perform tests determining strength of glycol and water solution and submit written test results.

END OF SECTION

SECTION 15540

HVAC PUMPS

PART 1 GENERAL

1.01 WORK INCLUDED

A. In-Line Circulators.

1.02 RELATED WORK

A. Section 15250 - Mechanical Insulation.

B. Section 15411 – Plumbing and Hydronic Piping.

C. Section 15515 - Hydronic Specialties.

1.03 REFERENCES

A. ANSI/UL 778 - Motor Operated Water Pumps.

1.04 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacture, assembly, and field performance of pumps with minimum three years experience.

B. Alignment: Base mounted pumps shall be aligned by qualified millwright and alignment certified.

1.05 SUBMITTALS

A. Submit product data under provisions of Division 1.

B. Submit certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.

1.06 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Division 1.

B. Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 1.

B. Store and protect products under provisions of Division 1.

1.08 EXTRA PARTS

A. Provide one extra set of mechanical seals for each pump and one complete pump for each model of pump in project.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Grundfos.

B. Substitutions: Under provisions of Division 1.

2.02 GENERAL CONSTRUCTION REQUIREMENTS

A. Balance: Rotating parts, statically and dynamically.

B. Construction: To permit servicing without breaking piping or motor connections.

C. Pump Connections: Flanged.

2.03 IN-LINE CIRCULATORS

A. Type: Maintenance free, self-lubricated, single or three (3) speed industrial/commercial single stage, direct drive circulator.

B. Casing: Cast iron or stainless steel

C. Impeller: Type 304 stainless steel.

D. Bearings: Upper and lower radial bearings to be aluminum oxide ceramic, tungsten carbide shaft bearing surfaces.

E. Shaft: Stainless steel with type 430F.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install pumps in accordance with manufacturer's instructions.

B. Provide access space around pumps for service. Provide no less than minimum as recommended by manufacturer.

C. Ensure pumps 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.

D. In-line pumps are supported by adjacent piping.

E. Provide line sized shut-off valve on pump suction, and line sized check valve, balance valve and shut-off valve pump discharge.

END OF SECTION

SECTION 15556

CAST IRON BOILERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Boilers.

B. Controls and Boiler Trim.

C. Hot Water Connections.

D. Fuel Connection.

1.02 RELATED SECTIONS

A. Section 15411 - Plumbing and Hydronic Piping.

B. Section 15515 - Hydronic Specialties.

1.03 REFERENCES

A. ANSI/ASME SEC4 - Boiler and Pressure Vessel Codes - Rules for Construction of Heating Boilers.

B. ANSI/ASME SEC8D - Boilers and Pressure Vessel Codes - Rules for Construction of Pressure Vessels.

C. ANSI/NFPA 70 - National Electrical Code.

D. ANSI/UL 726 - Oil-Fired Boiler Assemblies.

E. HI (Hydronics Institute) - Testing and Rating Standard for Cast Iron and Steel Heating Boilers.

1.04 SUBMITTALS

A. Submit product data under provisions of Division 1.

B. Submit product data indicating gross input/output, I-B-R net rating, fuel type, electrical requirements, accessories, trim, controls, general layout, dimensions, and size and location of connections.

1.05 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Division 1.

B. Include manufacturer's descriptive literature, operating instructions, cleaning procedures, replacement parts list, and maintenance and repair data.

1.06 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum three years experience.

1.07 REGULATORY REQUIREMENTS

A. Conform to ANSI/NFPA 70 code for internal wiring of factory wired equipment.

B. Conform to ANSI/ASME SEC4 and SEC 8D for boiler construction.

C. Units: UL labeled.

D. ASME “H” Stamp.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 1.

B. Store and protect products under provisions of Division 1.

C. Protect units before, during, and after installation from damage to casing by leaving factory shipping packaging in place until immediately prior to final acceptance.

1.09 WARRANTY

A. Provide one year pro-rated warranty under provisions of Division 1.

B. Warranty: Include coverage for cast iron boiler sections.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Weil McLain.

B. Substitutions: Under provisions of Division 1.

2.02 MANUFACTURED UNITS

A. Hot water boilers suitable for forced draft insulated jacket, sectional cast iron heat exchanger, oil burning system, refractory, controls, and boiler trim.

B. For forced draft firing, provide water wall design consisting of water backed combustion area with water circulating around firebox. Refractory chamber or separate base not required.

2.03 FABRICATION

A. Assemble from cast iron sections with 30 psig ANSI/ASME Boilers and Pressure Vessels Code Rating.

B. Provide clean-out and access doors, observation ports, and relief openings to flue passages.

C. Provide structural base of aluminized steel lined with high temperature mineral fiber insulating panels.

D. Provide glass fiber insulated steel jacket, finished with factory applied baked enamel.

2.04 HOT WATER BOILER TRIM

A. Combination water pressure and temperature gauge, and ASME rated pressure relief valve, sized to boiler gross output.

B. Float type, testable, low water cut-off with manual reset to automatically prevent burner operation when boiler water falls below safe level, with power failure automatic reset.

C. Operating temperature controller with outdoor reset to maintain boiler water temperature.

D. Electronic operating temperature controller with full cover for wall mounting, ambient temperature range - 30 to 150º F, adjustable reset ratio of outside air temperature change to discharge control point change 1:2 to 100:1, integral set point adjustment 80 to 230º F, electronic primary and outdoor sensors, for on-off switching of pilot duty single throw double pole relays.

E. Redundant high limit temperature controller for burner to prevent boiler water temperature from exceeding safe system temperature.

2.05 FUEL BURNING SYSTEM

A. Burner Operation: On-off with low fire position for ignition.

B. Oil Burner: High pressure atomizing type for No. 1 or 2 oil with combustion air blower, fuel pump, hinged flame inspection port, cadmium sulfide flame sensor, electrodes, ignition transformer, and oil nozzle.

C. 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.

D. 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.

2.06 PERFORMANCE

A. Performance rating shall be in accordance with HI - Testing and Rating Standard for Cast Iron and Steel Heating Boilers.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide for connection to electrical service. Refer to Section 16180.

C. Provide connection of gas service in accordance with ANSI/AGA Z223.1.

D. Pipe relief valves to nearest glycol tank.

3.02 MANUFACTURER'S FIELD SERVICES

A. Prepare and start systems under provisions of Division 1. Instruct operating personnel.

B. Submit written report after start-up including control settings and performance chart of control system.

C. Provide boiler set-up and adjustment before firing. Submit results of combustion test prior to final acceptance, including: Overfire and flue collar draft, CO_2, net stack temperature, smoke number, and percent efficiency. Tests are to be run by approved technician specializing in boiler maintenance.

END OF SECTION

SECTION 15575

BREECHINGS, CHIMNEYS, AND STACKS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated Breechings.

B. Manufactured Double Wall Chimneys for Fuel Fired Equipment.

C. Vent Dampers.

1.02 RELATED SECTIONS

A. Section 15556 - Cast Iron Boilers.

1.03 REFERENCES

A. ANSI/ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

B. ANSI/ASTM A525 - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, General Requirements.

C. Appliances.

D. ANSI Z95.1 (NFPA 31) - Standard for the Installation of Oil Burning Equipment.

E. ASHRAE - Handbook, Equipment Volume, Chapter "Chimney, Gas, Vent, and Fireplace Systems."

F. NFPA 211 - Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances.

G. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

H. UL 103 - Standard for Factory Built Low Heat Chimneys.

1.04 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 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.

1.05 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.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in the manufacture of products specified in this Section with minimum three years documented experience.

1.07 REGULATORY REQUIREMENTS

A. Conform to NFPA 31 for installation of oil burning appliances and equipment.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Schebler.

B. Metalbestos.

C. Hart & Cooley.

D. Substitutions: Under provisions of Division 1.

2.02 BREECHING

A. Provide adjustable self-actuating barometric draft dampers, where indicated, full size of breeching.

2.03 TYPE A - DOUBLE WALL METAL STACKS FOR OIL FIRED EQUIPMENT

A. Provide insulated double wall metal stacks, tested to UL 103 HT and UL listed, for use with building heating equipment, in compliance with NFPA 211.

B. Fabricate with 1 inch insulated space between walls. Construct inner jacket of minimum 28 gauge ANSI/ASTM A167 Type 430 stainless steel. Construct outer jacket of Type 430 stainless steel 30 gauge, up to 8 inches in diameter for sizes 10 inches and larger minimum 28 gauge.

C. Provide accessories each bearing factory applied UL label.
   1. Stainless steel roof support package.
   2. Low slope stainless steel flashing.
   3. Stainless steel storm collar.
   4. Stainless steel stack cap consisting of a conical rainshield with an inverted cone for partial rain protection and low flow resistance.
   5. NOTE: All stack accessories shall be stainless steel.

2.04 BAROMETIC DRAFT CONTROL

A. All steel construction, 24 gauge ring and gate with 26 gauge collar.

B. Calibrated counter weight.

C. Designed for settings from .02” to 0.08”

D. Model RC as manufactured by Field Controls.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide double wall, insulated chimney continuous from appliance outlet to exterior termination.

C. Install in accordance with recommendations of ASHRAE -Handbook, Equipment Volume, Chapter "Chimney, Gas, Vent, and Fireplace Systems", and NFPA 54.

D. Install breechings with minimum of joints. Align accurately at connections, with internal surfaces smooth.

E. Support breechings from building structure, rigidly with suitable ties, braces, hangers and anchors to hold to shape and prevent buckling. Support vertical breechings, chimneys, and stacks at 12 foot spacing, to adjacent structural surfaces, or at floor penetrations. Refer to

SMACNA HVAC Duct Construction Standards - Metal and Flexible for equivalent duct support configuration and size.

F. Pitch breechings with positive slope up from fuel-fired equipment to chimney or stack.

G. Maintain UL listed minimum clearances from combustibles. Assemble pipe and accessories as required for complete installation.

H. Install barometric dampers accordance with the manufacturer's instructions. Adjust draft control using instrumentation.

I. Assemble and install stack sections in accordance with the manufacturer's instructions.

J. Level and plumb chimney and stacks.

K. Clean breechings, chimneys, and stacks during installation, removing dust and debris.

L. At appliances, provide slip joints permitting removal of appliances without removal or dismantling of breechings, chimneys, or stacks.

M. No single wall vent connectors or breechings are permitted.

END OF SECTION

SECTION 15730

HEAT RECOVERY VENTILATOR

PART 1 GENERAL

1.01 WORK INCLUDED

A. Heat Recovery Ventilator.

1.02 RELATED WORK

A. Section 15050 – Basic Mechanical Materials and Methods

B. Section 15250 - Mechanical Insulation.

C. Section 15890 – Ductwork.

D. Section 15910 - Ductwork Accessories.

1.03 REFERENCES

A. AMCA 99 - Standards Handbook.

B. AMCA 210 - Laboratory Methods of Testing Fans for Rating Purposes.

C. AMCA 300 - Test Code for Sound Rating Air Moving Devices.

D. AMCA 301 - Method of Publishing Sound Ratings for Air Moving Devices.

E. AMCA 500 - Test Methods for Louver, Dampers, and Shutters.

F. ANSI/AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings.

G. ANSI/AFBMA 11 - Load Ratings and Fatigue Life for Roller Bearings.

H. ANSI/UL 900 - Test Performance of Air Filter Units.

I. SMACNA - Low Pressure Duct Construction Standards.

1.04 QUALITY ASSURANCE

A. Fan Performance Ratings: Conform to AMCA 210.

B. Filter Media: Rated to MERV 13.

C. Heat Recovery Venilator: Product of manufacturer regularly engaged in production of components who issues complete catalog data on total product.

1.05 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 1.

B. Product data shall indicate dimensions, weights, capacities, ratings, fan performance, motor electrical characteristics, and gauges and finishes of materials.

C. Provide fan curves with specified operating point clearly plotted.

D. Submit sound power levels for both fan outlet and casing radiation at rated capacity.

E. Submit product data of filter media, filter performance data, filter assembly, and filter frames.

F. Submit controller product data, include electrical requirements for power supply wiring including wiring diagrams power and control wiring, clearly indicating factory-installed and field-installed wiring.

G. Submit manufacturer's installation instructions under provisions of Section 1.

H. Submit training syllabus.

1.06 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Section 1. Prior to substantial completion.

B. Include instructions for lubrication, filter replacement, motor and drive replacement, spare parts lists, and wiring diagrams.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Section 15050 in factory-fabricated protective containers, with factory-installed shipping skids and lifting lugs.

B. Store and protect products under provisions of Section 15050.

C. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

1.09 EXTRA STOCK

A. Provide one set of disposable panel filters under provisions of Section 1.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS – HEAT RECOVERY VENTILATOR

A. American Aldes

B. Venmar.

C. Substitutions: Under provisions of Section 1.

2.02 HEAT RECOVERY VENTILATOR

A. The heat recovorey ventilator shall be constructed with a single bank cross-fl ow plate heat exchangers,with thermal eff ectiveness of 68 to 72%. Plate design minimizes cross contamination of the supply air by the exhaust.

B. Fabricate units with centrifugal fans, forward curved inclined blades, totally enclosed fan motor with class B insulation, permanently sealed and greased bearings.

C. Washable air filters in exhaust and supply air streams.

D. Base performance on sea level conditions.

2.03 HEAT RECOVERY VENTILATOR - CONTROLS

A. Controls for heat recovery ventilator shall be factory supplied control panel with frost control, see Section 15985 for required sequence of operation.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Locate unit accessible for summer/winter adjustment and maintenance of filters and controls.

C. Connect unit to ductwork using flexible connections.

D. Provide access panels in ductwork at exhaust/supply inlet/outlet to facilitate cleaning of core hx.

3.02 TRAINING

A. Provide 2 hours minimum training for operation and service of the heat recovery ventilator.

END OF SECTION

SECTION 15751

GLYCOL SYSTEM

PART 1 GENERAL

1.01 WORK INCLUDED

A. Mixing and Charging Tank.

B. Propylene Glycol Solution.

1.02 RELATED WORK

A. Section 15411 – Plumbing and Hydronic Piping.

B. Section 15515 - Hydronic Specialties.

1.03 SUBMITTALS

A. Submit product data under provisions of Division 1.

B. Submit glycol strength test results.

1.04 WARRANTY

A. Replace glycol solution lost from the systems from any cause other than neglect by Owner during the first year of operation.

B. Thoroughly check system and make necessary corrections if system continually loses solution.

1.05 EXTRA STOCK

A. Provide one 55 gallon sealed drums of pre-mixed solution.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Dow Chemical Co.

B. CH20 Chemical Co.

C. Substitutions: Under provisions of Division 1.

2.02 TANKS

A. Provide Axiom packaged glycol charging system as specified on the contract drawings.

2.03 GLYCOL SOLUTION

A. Glycol Solution: Inhibited propylene glycol and water solution mixed 50-50 suitable for operating temperatures of -29º F. Premixed by manufacturer and shipped to site in sealed containers.

B. Dowfrost HD as manufactured by Dow Chemicals.

PART 3 EXECUTION

3.01 INSTALLATION

A. Provide necessary piping to complete installation.

B. Thoroughly clean and flush system before adding glycol solution.

C. Feed glycol to system through make-up line with pressure regulator venting system high points. Set to fill at 5 psi when cold and adjust to 12 psi when hot.

D. Perform tests determining strength of glycol solution before system is turned over to Owner. Provide test prior to end of first year of operation and replenish as required.

END OF SECTION

SECTION 15790

AIR COILS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glycol Coils.

1.02 RELATED SECTIONS

A. Section 15250 - Mechanical Insulation.

B. Section 15515 - Hydronic Specialties.

C. Section 15890 – Ductwork.

1.03 REFERENCES

A. ANSI/ARI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils.

B. SMACNA - HVAC Duct Construction Standards, Metal and Flexible.

1.04 SUBMITTALS

A. Submit shop drawings under provisions of Division 1.

B. Submit shop drawings indicating coil and frame configurations, dimensions, materials, rows, connections, and rough-in dimensions.

C. Submit product data under provisions of Division 1.

D. Submit product data indicating coil and frame configurations, dimensions, materials, rows, connections, and rough-in dimensions.

E. Submit manufacturer's installation instructions under provisions of Division 1.

1.05 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum three years experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 1.

B. Store and protect products under provisions of Division 1.

C. Protect coil fins from crushing and bending by leaving in shipping cases until installation, and by storing indoors.

D. Protect coils from entry of dirt and debris with pipe caps or plugs.

PART 2 PRODUCTS

2.01 MANUFACTURERS - HYDRONIC COILS

A. US Coil

B. Trane.

C. York.

D. Substitutions: Under provisions of Division 1.

2.02 FABRICATION

A. Tubes: 5/8 inch OD seamless copper arranged in parallel or staggered pattern, expanded into fins, silver brazed joints.

B. Fins: Aluminum continuous plate type with full fin collars or individual helical finned tube type wound under tension.

C. Casing: Die formed channel frame of 16 gauge galvanized steel with 3/8 inch mounting holes on 6 inch centers. Provide tube supports for coils longer than 36 inches.

D. Capacity: As scheduled.

2.03 GLYCOL HEATING COILS

A. Headers: Cast iron with tubes expanded into header, seamless copper tube with silver brazed joints, or prime coated steel pipe with brazed joints.

B. Testing: Air test under water to 200 psig for working pressure of 200 psig and 220º F.

C. Configuration: Drainable, with threaded plugs in headers for drain and vent; threaded plugs in return bends and in headers opposite each tube.

D. Fin Spacing: 11 fins per inch.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in ducts and casings in accordance with SMACNA HVAC Duct Construction Standards, Metal and Flexible.

C. Support coil sections independent of piping on steel channel or double angle frames and secure to casings. Provide frames for maximum three coil sections. Arrange supports to avoid piercing drain pans. Provide airtight seal between coil and duct or casing.

D. Protect coils to prevent damage to fins and flanges. Comb out bent fins.

E. Install coils level. Install cleanable tube coils with 1:50 pitch.

F. Make connections to coils with unions and flanges.

G. On water coils, provide shut-off valve on supply line and lockshield balancing valve on return line. Locate water supply at bottom of supply header and return water connection at top. Provide manual air vents at high points complete with stop valve. Ensure coils are drainable and provide drain connection at low points.

H. On water and glycol heating coils, connect supply piping to leaving air side of coil (counterflow arrangement).

I. Insulate headers located outside air flow as specified for piping.

END OF SECTION

SECTION 15835

TERMINAL HEAT TRANSFER UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fintube Radiation.

B. Unit Heaters.

1.02 RELATED SECTIONS

A. Section 15411 – Plumbing and Hydronic Piping.

B. Section 15515 - Hydronic Specialties.

C. Section 15751 - Glycol System.

1.03 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

1.04 SUBMITTALS

A. Submit product data under provisions of Division 1.

B. Submit schedules of equipment and enclosures typically indicating length and number of pieces of element and enclosure, corner pieces, end caps, cap strips, access doors, pilaster covers, and comparison of specified heat required to actual heat output provided.

C. Indicate mechanical and electrical service locations and requirements, specifically indicating deviations from indicated products.

1.05 PROJECT RECORD DOCUMENTS

A. Submit record documents under provisions of Division 1.

B. Accurately record actual locations of access doors in radiation cabinets required for access or valving.

1.06 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Division 1.

B. Include manufacturer’s descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.

1.07 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum three years experience.

1.08 REGULATORY REQUIREMENTS

A. Conform to applicable code for internal wiring of factory wired equipment.

1.09 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site under provisions of Division 1.

B. Store and protect products under provisions of Division 1.

C. Protect units from physical damage by storing in protected areas and leaving factory covers in place.

1.10 SEQUENCING AND SCHEDULING

A. Install radiation, convectors, fan-coil units, unit ventilators and radiant heaters (equipment exposed to finished areas) after walls and ceiling are finished and painted. Avoid damage.

1.11 WARRANTY

A. Provide one year manufacturer's warranty under provisions of Division 1.

B. Warranty: Include coverage of unit heater motors.

PART 2 PRODUCTS

2.01 MANUFACTURERS - BASEBOARD RADIATION, UNIT HEATERS

A. Modine.

B. Trane.

C. Sterling.

D. Substitutions: Under provisions of Division 1.

2.02 BASEBOARD RADIATION – FT-1

A. Heating Elements: 3/4 inch ID copper tubing mechanically expanded into flanged collars of evenly spaced aluminum fins, one tube end belled.

B. Enclosure: 14 inch tall, slope top. Minimum 18 gauge steel one piece top and front panel. 20 gauge pre-painted back plate. Provide all end panel, end caps, corners, access panels and joiner pieces.

C. Finish: Factory applied baked enamel of white color on visible surfaces of enclosure or cabinet.

D. Element Brackets: 18 gauge galvanized steel to support from panel and noise free element cradle.

2.03 FINTUBE RADIATION – FT-2

A. Heating Elements: two (2) rows, 1 inch ID copper tubing mechanically expanded into flanged collars of evenly spaced aluminum fins with phenolic epoxy coating, one tube end belled.

B. Enclosure: 25 inch tall, double slope top. Minimum 18 gauge stainless steel one piece top, front and bottom panel. 20 gauge pre-painted back plate, provide all end panel, end caps, corners, and joiner pieces.

C. Element Brackets: 18 gauge galvanized steel to support from panel and noise free element cradle.

2.04 UNIT HEATERS

A. Coils: Seamless copper tubing, 0.025 inch minimum wall thickness, silver brazed to steel headers, and with evenly spaced aluminum fins mechanically bonded to tubing.

B. Casing: 18 gauge steel with threaded pipe connections for hanger rods.

C. Finish: Factory apply baked enamel color as selected on visible surfaces of enclosure or cabinet.

D. Fan: Direct drive propeller type, statically and dynamically balanced, with fan guard; horizontal models with permanently lubricated sleeve bearings; vertical models with grease lubricated ball bearings.

E. Air Outlet: Adjustable louvers on horizontal throw models.

F. Motor: Refer to Section 15050 horizontal models with permanently lubricated sleeve bearings; vertical models with grease lubricated ball bearings.

G. Control: Local, lockable disconnect switch.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work and opening dimensions are as instructed by the manufacturer.

B. Verify that required utilities are available, in proper location, and ready for use.

C. Beginning of installation means installer accepts existing surfaces.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Locate baseboard radiation on outside walls and run cover continuously wall-to-wall unless otherwise indicated. Center elements under windows. Where multiple windows occur over units, divide element into equal segments centered under each window. Install end caps where units butt against walls.

C. Hang unit heaters from building structure, with pipe hangers anchored to building, not from piping. Mount as high as possible to maintain greatest headroom unless otherwise indicated.

D. Protect units with protective covers during balance of construction.

E. Provide hydronic units with shut-off valve on supply and lockshield balancing valve on return piping. If not easily accessible, extend vent to exterior surface of cabinet for easy servicing. For cabinet unit heaters, fan coil units, and unit heaters, provide float operated automatic air vents with stop valve.

3.03 CLEANING

A. Clean work under provisions of Division 1.

B. After construction is completed, including painting, clean exposed surfaces of units. Vacuum clean coils and inside of cabinets.

C. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.

END OF SECTION

SECTION 15870

POWER VENTILATORS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Wall Exhausters.

B. Cabinet Exhaust Fans.

C. Ceiling Exhaust Fans.

1.02 RELATED WORK

A. Section 15890 - Ductwork.

B. Section 15910 - Duct Accessories: Backdraft dampers.

1.03 REFERENCES

A. AMCA 99 - Standards Handbook.

B. AMCA 210 - Laboratory Methods of Testing Fans for Rating Purposes.

C. AMCA 300 - Test Code for Sound Rating Air Moving Devices.

D. AMCA 301 - Method of Publishing Sound Ratings for Air Moving Devices.

E. SMACNA - Low Pressure Duct Construction Standard.

1.04 QUALITY ASSURANCE

A. Performance Ratings: Conform to AMCA 210.

B. Sound Ratings: AMCA 301, tested to AMCA 300.

C. Fabrication: Conform to AMCA 99.

1.05 SUBMITTALS

A. Submit product data under provisions of Division 1.

B. Provide product data on wall and roof exhausters, and ceiling and cabinet fans.

C. Provide fan curves with specified operating point clearly plotted.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS – POWER VENTILATORS

A. Cook.

B. Greenheck.

C. Acme.

D. Substitutions: Under provisions of Division 1.

2.02 DIRECT DRIVE SQUARE CENTRIFUGAL SUPPLY/EXHAUST FANS

A. Fan shall be duct mounted, direct driven centrifugal square inline.

B. Certifications: Fan shall be manufactured at an ISO 9001 certified facility. Fan shall be listed by Underwriters Laboratories (UL 705). Fan shall bear the AMCA certified ratings seal for sound and air performance.

C. Construction: The fan shall be of bolted construction utilizing corrosion resistant fasteners. Housing shall be minimum 18 gauge galvanized steel with integral duct collars. Bolted access doors shall be provided on three sides, sealed with closed cell neoprene gasketing. Housing shall be pre-drilled to accommodate universal mounting feet for vertical or horizontal installation. Unit shall bear an engraved aluminum nameplate. Nameplate shall indicate design CFM and static pressure.

D. Wheel: Wheel shall be centrifugal backward inclined, constructed of 100% aluminum, including a precision machined cast aluminum hub. Wheel inlet shall overlap an aerodynamic aluminum inlet cone to provide maximum performance and efficiency. Wheel shall be balanced in accordance with AMCA standard 204-96, balance quality and vibration levels for fans.

E. Motor: Motor shall be heavy duty type with permanently lubricated sealed bearings and furnished at the specified voltage, phase and enclosure. Single phase motors shall be thermally protected, three phase motors shall have controllers with thermal protection

2.03 CENTRIFUGUAL EXHAUST FANS

A. Fan shall be inline mounted, direct driven, centrifugal exhaust fan.

B. Certifications: Fan shall be manufactured at an ISO 9001 certified facility. Fan shall be listed by Underwriters Laboratories (UL 705). Fan shall bear the AMCA Certified Ratings Seal for Sound and Air Performance.

C. Construction: The fan housing shall be minimum 20 gauge galvanized steel and acoustically Insulated. Blower and motor assembly shall be mounted to a minimum 14 gauge reinforcing channel and shall be easily removable from the housing. Motor shall be mounted on vibration isolators. Unit shall be supplied with integral wiring box and disconnect receptacle shall be standard. Discharge position shall be convertible from right angle to straight through by moving interchangeable panels. The outlet duct collar shall include a reinforced aluminum damper with continuous aluminum hinge rod and brass bushings. To accommodate different mounting positions, an adjustable prepunched mounting bracket shall be provided.

D. Wheel: Wheel shall be centrifugal forward curved type, constructed of galvanized steel. Wheel shall be balanced in accordance with AMCA Standard 204-96, Balance Quality and Vibration Levels for Fans.

E. Motor: Motor shall be open drip proof type with permanently lubricated bearings, built-in thermal overload protection and disconnect plug. Motor shall be furnished at the specified voltage. Single phase motors shall be thermally protected, three phase motors shall have controllers with thermal protection

2.04 CEILING DESTRATIFICATION FANS

A. Motor: PSC Motor, externally wound, IP44 enclosure, 30,000 – 40,000 hour lubricated service life bearings.

B. Housing: PA6 glass-fiber reinforced plastic, Fire Resistant 5vB rated, UV Treated.

C. Accessories: Variable speed, spring-wound/wall-mounted timer control, installation hardware, 8’ Main cable with 3/8” threaded end and gripple, 12’ Stabilization tether and gripple

PART 3 EXECUTION

3.01 INSTALLATION

A. Install fans in accordance with manufacturer's instructions.

B. Do not operate fans for any purpose until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

C. Install fans as with resilient mountings and flexible electrical leads..

D. Install flexible connections between fan inlet and discharge ductwork where indicated. Ensure metal bands of connectors are parallel with minimum one inch flex between ductwork and fan while running.

E. Install fan restraining snubbers as indicated. Flexible connectors shall not be in tension while running.

F. Provide safety screen where inlet or outlet is exposed.

G. Provide backdraft dampers on discharge of exhaust fans and as indicated.

END OF SECTION

SECTION 15890

DUCTWORK

PART 1 GENERAL

1.01 WORK INCLUDED

A. Low Pressure Ducts.

1.02 RELATED WORK

A. Section 15250 – Mechanical Insulation.

B. Section 15910 - Ductwork Accessories.

C. Section 15936 - Air inlets and Outlets.

D. Section 15990 – Balancing and Testing.

1.03 REFERENCES

A. ASHRAE - Handbook 1981 Fundamentals; Chapter 33 - Duct Design.

B. ASHRAE - Handbook 1983 Equipment; Chapter 1 - Duct Construction.

C. ASTM A 90 - Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles.

D. ASTM A 525 - General Requirements for Steel Sheet, Zinc- Coated (Galvanized) by the Hot-Dip Process.

E. ASTM A 527 - Steel Sheet, Zinc-Coated (Galvanized) by Hot-Dip Process, Lock Forming Quality.

F. ASTM B209 - Aluminum and Aluminum Alloy Sheet and Plate.

G. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

H. NFPA 90B - Installation of Warm Air Heating and Air Conditioning Systems.

I. SMACNA - HVAC Duct Construction Standards.

J. UL 181 - Factory-Made Air Ducts and Connectors.

1.04 DEFINITIONS

A. Duct Sizes: Inside clear dimensions. For lined ducts, maintain sizes inside lining.

B. Low Pressure: Three pressure classifications: ½ inch WG positive or negative static pressure and velocities less than 2,000 fpm; 1 inch WG positive or negative static pressure and velocities less than 2,500 fpm and 2 inch WG positive or negative static pressure and velocities less than 2,500 fpm.

1.05 SUBMITTALS

A. Submit under provisions of Division 1.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 1.

B. Store and protect products under provisions of Division 1.

PART 2 PRODUCTS

2.01 MATERIALS

A. General: Non-combustible or conforming to requirements for Class 1 air duct materials, or UL 181.

B. Steel Ducts: ASTM A527 galvanized steel sheet, lock-forming quality, having zinc coating of 1.25 oz. per sq. ft. for each side in conformance with ASTM A90.

C. Fasteners: Rivets, bolts, or sheet metal screws, galvanized.

D. Sealant: Non VOC, water based, won-hardening, water resistant, fire resistive, compatible with mating materials; liquid used alone or with tape, or heavy mastic.

E. Hanger Rod: Steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.02 LOW PRESSURE DUCTWORK

A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards and ASHRAE handbooks, except as indicated. Provide duct material, gauges, reinforcing, and sealing for operating pressures indicated.

B. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts. No variation of duct configuration or sizes permitted except by written permission.

C. Construct T's, bends, and elbows with radius of not less than 1-½ times width of duct on centerline. Where not possible and where rectangular elbows are used, provide air foil turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fiber insulation.

D. Increase duct sizes gradually, not exceeding 15º divergence wherever possible. Divergence upstream of equipment shall not exceed 30º; convergence downstream shall not exceed 45º.

E. Provide easements where low pressure ductwork conflicts with piping and structure. Where easements exceed 10 percent duct area, split into two ducts maintaining original duct area.

F. Connect flexible ducts to metal ducts with draw bands.

G. Use crimp joints with or without bead for joining round duct sizes 12 inch and smaller with crimp in direction of air flow.

H. Use double nuts and lock washers on threaded rod supports.

PART 3 EXECUTION

3.01 INSTALLATION

A. Obtain manufacturer's inspection and acceptance of fabrication and installation of glass fiber ductwork at beginning of installation.

B. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pitot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

C. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

D. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

3.02 DUCTWORK APPLICATION SCHEDULE

Air System	Material
Low Pressure Supply	Steel
Return and Relief	Steel
General Exhaust	Steel
Outside Air Intake	Steel
Combustion Air	Steel

3.03 ADJUSTING AND CLEANING

A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment which may be harmed by excessive dirt with temporary filters, or bypass during cleaning.

B. Clean duct systems with high power vacuum machines. Protect equipment which may be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes.

END OF SECTION

SECTION 15910

DUCTWORK ACCESSORIES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Volume Control Dampers.

B. Backdraft Dampers.

C. Air Turning Devices.

D. Flexible Duct Connections.

E. Duct Access Doors.

F. Duct Test Holes.

G. Turning Vanes.

1.02 RELATED WORK

A. Section 15890 - Ductwork.

1.03 REFERENCES

A. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

B. SMACNA - HVAC Duct Construction Standards.

C. UL 33 - Heat Responsive Links for Fire-Protection Service.

D. UL 555 - Fire Dampers and Ceiling Dampers.

1.04 SUBMITTALS

A. Submit product data under provisions of Division 1.

PART 2 PRODUCTS

2.01 VOLUME CONTROL DAMPERS.

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards, and as indicated.

B. Fabricate splitter dampers of material same gauge as duct to 24 inches size in either direction, and two gauges heavier for sizes over 24 inches.

C. Fabricate splitter dampers of single thickness sheetmetal to streamline shape. Secure blade with continuous hinge or rod. Operate with minimum 1/4 inch diameter rod in self aligning, universal joint action flanged bushing with set screw.

D. Fabricate single blade dampers for duct sizes to 9-1/2 x 30 inch.

E. Fabricate multi-blade damper of opposed blade pattern with maximum blade sizes 12 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

F. Except in round ductwork 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.

G. Provide locking, indicating quadrant regulators on single and multi-blade dampers. Where rod lengths exceed 30 inches provide regulator at both ends. Where volume dampers are located

above gypsum or other non-accessible ceilings, extend damper rods to ceiling and install recessed concealed regulator with adjustable cover for flush installation, with cover. Exposed portions shall be chrome plated. Regulator shall include spring washer, lock nut, coupling, ninety degree screw or gear drive and rod as required, Young Regulator or equal.

H. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

2.02 ACCEPTABLE MANUFACTURERS - BACKDRAFT DAMPERS

A. Ruskin.

B. Greenheck.

C. Tuttle & Bailey.

D. Substitutions: Under provisions of Division 1.

2.03 BACKDRAFT DAMPERS

A. Gravity backdraft dampers, size 18 x 18 inches or smaller, furnished with air moving equipment, may be air moving equipment manufacturers standard construction.

B. Fabricate multi-blade, parallel action gravity balanced backdraft dampers of 16 gauge galvanized steel, or extruded aluminum, with center pivoted blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

2.04 ACCEPTABLE MANUFACTURERS - AIR TURNING DEVICES

A. Duro-Dyne.

B. Substitutions: Under provisions of Division 1.

2.05 AIR TURNING DEVICES

A. Multi-blade device with blades aligned in short dimension; steel or aluminum construction; with individually adjustable blades, mounting straps.

2.06 ACCEPTABLE MANUFACTURERS - FLEXIBLE DUCT CONNECTIONS

A. Duro-Dyne.

B. Substitutions: Under provisions of Division 1.

2.07 FLEXIBLE DUCT CONNECTIONS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards, and as indicated.

B. UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 20 oz. per sq. yd., approximately 3 inches wide, crimped into metal edging strip.

2.08 ACCEPTABLE MANUFACTURERS - DUCT ACCESS DOORS

A. Ruskin.

B. Duro-Dyne.

C. Hart & Cooley.

D. Substitutions: Under provisions of Division 1.

2.09 DUCT ACCESS DOORS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards and as indicated.

B. Review locations prior to fabrication.

C. Fabricate rigid and close-fitting doors of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ductwork, install minimum one inch thick insulation with sheet metal cover.

D. Access doors smaller than 12 inches square may be secured with sash locks.

E. Provide two hinges and two sash locks for sizes up to 18 inches square, three hinges and two compression latches with outside and inside handles for sizes up to 24 x 48 inches. Provide an additional hinge for larger sizes.

F. Access doors with sheet metal screw fasteners are not acceptable.

2.10 DUCT TEST HOLES

A. Cut or drill temporary test holes in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Permanent test holes shall be factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.11 TURNING VANES

A. Double Width: Air foil design double width galvanized turning vanes with 2 inch inside radius.

B. Single Width: Single galvanized turning vane with 2 inch radius and minimum 1" trailing straight leg.

C. Acoustical Vanes: Double width vanes with inner vane of perforated galvanized steel with 3/32 inch holes on 5/32 inch spacing. Fill space between vanes with minimum 1.5 lb/cu ft glass fiber duct liner.

2.12 ACCEPTABLE MANUFACTURERS - DAMPERS

A. Ruskin.

B. Greenheck.

C. Louvers and Dampers, Inc.

D. Substitutions: Under provisions of Division 1.

2.13 BACKDRAFT DAMPERS

A. Fabricate multi-blade, parallel action, counter balanced backdraft dampers of extruded aluminum, with end pivoted blades of maximum 6 inch width, with extruded vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, dust-proof steel ball bearings, and plated steel pivot pin; adjustable counterbalance weights capable of adjustment in the range of .01 to .05" water gauge.

2.14 CONTROL DAMPERS

A. Multi-blade, Opposed blade action, control dampers of extruded aluminum, with airfoil type blades of maximum six inch width, blades positioned across short air opening dimension, field replaceable extruded vinyl sealed edges, linked together in rattle-free manner, non-corrosive molded synthetic bearings, square or hexagonal axles for positive locking connection to blades and linkage, with documented leakage rate not to exceed 6 CFM/sq. ft. at 4 inch W.G.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions.

B. Provide balancing dampers at points on low pressure supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Use splitter dampers only where indicated. Locate dampers a minimum 15 feet upstream of all air inlets and outlets.

C. Provide balancing dampers on medium and high pressure systems where indicated.

D. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

E. Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment.

F. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, and elsewhere as indicated. Provide minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated.

G. Provide duct test holes where indicated and required for testing and balancing purposes.

H. Provide double width turning vanes at all constant cross-section rectangular duct elbows at 2" spacing across elbow diagonal. Provide at rectangular reducing elbows single width turning vanes with trailing edge sat 2" spacing across elbow diagonal.

I. Provide acoustical turning vanes at 2" spacing across elbow diagonal where indicated.

END OF SECTION

SECTION 15936

AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Ceiling Supply Grilles.

B. Ceiling Exhaust and Return Grilles.

C. Ceiling Grid Core Exhaust and Return Grilles.

1.02 REFERENCES

A. ADC 1062 - Certification, Rating and Test Manual.

B. ANSI/NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

C. ARI 650 - Air Outlets and Inlets.

D. ASHRAE 70 - Method of Testing for Rating the Air Flow Performance of Outlets and Inlets.

E. SMACNA - HVAC Duct Construction Standard.

1.03 QUALITY ASSURANCE

A. Test and rate performance of air outlets and inlets in accordance with ADC Equipment Test Code 1062 and ASHRAE 70.

B. Test and rate performance of louvers in accordance with AMCA 500.

1.04 REGULATORY REQUIREMENTS

A. Conform to ANSI/NFPA 90A.

B. Earthquake tabs, in seismic zones, in accordance with IBC Standards.

1.05 SUBMITTALS

A. Submit product data under provisions of Division 1.

B. Provide product data for items required for this project.

C. Review requirements of outlets and inlets as to size, finish, and type of mounting prior to submitting product data.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Titus.

B. Price.

C. Amenostat.

D. Substitutions: Under provisions of Division 1.

2.02 CEILING SUPPLY GRILLES

A. Streamlined and individually adjustable curved blades to discharge air along face of grille, two-way deflection.

B. Fabricate 1-1/4 inch margin frame with countersunk screw mounting and gasket.

C. Fabricate of aluminum extrusions with factory off-white enamel finish.

2.03 CEILING EXHAUST AND RETURN GRILLES

A. Streamlined blades, depth of which exceeds 3/4 inch spacing, with spring or other device to set blades, horizontal face.

B. Fabricate 1-1/4 inch margin frame with countersunk screw mounting.

C. Fabricate of steel with 20 gauge minimum frames and 22 gauge minimum blades, steel and aluminum with 20 gauge minimum frame, or aluminum extrusions, with factory baked enamel off-white finish.

D. Where not individually connected to exhaust fans, provide integral, gang-operated opposed blade dampers with removable key operator, operable from face.

2.04 CEILING GRID CORE EXHAUST AND RETURN GRILLES

A. Fixed grilles of 1/2 x 1/2 x 1/2 inch louvers.

B. Fabricate 1-1/4 inch margin frame with countersunk screw mounting.

C. Fabricate of aluminum with factory baked enamel finish.

D. Provide earthquake tabs for installation in lay-in ceiling.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install items in accordance with manufacturers' instructions.

B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

C. Install diffusers to ductwork with air tight connection.

D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, regardless of whether dampers are specified as part of the diffuser, or grille and register assembly.

E. Paint ductwork visible behind air outlets and inlets matte black.

END OF SECTION

SECTION 15975

DIRECT DIGITAL CONTROL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes the Building Management System (BMS) control equipment for HVAC systems and components.

B. The scope of work consists of replacing the existing Main Control Module with a web accessible Main control Module, reconnecting existing equipment controls and expanding the system to incorporate new systems as shown on the drawings and described in this section and in Section 15985 – Sequence of Operations.

1.02 RELATED WORK

A. The work of the following Sections is related to the work of this Section. Other Section, not referenced below, may also be related to this work. It is the Contractor's responsibility to perform all the work required by the Contract Documents.
   1. Section 1300 – Project Data Submittals
   2. Section 01660 – Facility Start-Up and Testing
   3. Section 1665 – Facility Training
   4. Section 15540 – HVAC Pumps
   5. Section 15556 – Cast Iron Boilers
   6. Section 15910 – Ductwork Accessories
   7. Section 15730– Heat Recovery Ventilators
   8. Section 15985 – Sequence of Operations
   9. Section 15990 – Testing Adjusting and Balancing
   10. Section 16050- Electrical Work, General
   11. Section 16480 – Low Voltage Motor Control Centers.

1.03 DEFINITIONS

A. AHDC: Air Handler Digital Controller

B. ARP: Address Resolution Protocol

C. CAC: Custom Application Controller.

D. CSMA/CD: Carrier Sense Multiple Access/Collision Detect

E. DDC: Direct Digital Control

F. DDE: Dynamic Data Exchange

G. GUI: Graphical User Interface

H. HHOT: Hand Held Operators Tool

I. HVAC: Heating, Ventilation, and Air Conditioning

J. LAN: Local Area Network

K. MER: Mechanical Equipment Room

L. ODBC: Open Database Connectivity

M. PID: Proportional, Integral, Derivative

N. SQL: Structured Query Language

O. UDC: Unitary Digital Controller

P. UDP: User Datagram Protocol

Q. UNC: Universal Network Controller

1.04 SYSTEM DESCRIPTION ETHERNET (IEEE 802.3), PEER-TO-PEER CSMA/CD

A. Furnish all labor, materials, equipment, and service necessary for a complete and operating temperature control system, utilizing a high speed peer to peer network of interoperable Direct Digital Controls (DDC), existing Graphical User Interface (GUI) with color graphic displays on at least 64 client computers, and electronic interfaces and actuation devices, as shown on the drawings and as described herein. The Direct Digital Control system for this project shall be a Schneider Electric I/A Series system and shall be furnished and installed by the factory authorized Schneider Electric Building Automation contractor in Alaska. The control contractor shall maintain an office in Fairbanks or Anchorage with repair parts and maintenance personnel to ensure prompt response to an emergency call during the warranty period. The contractor shall maintain a complete sales, engineering, installation and service organization.

B. The Local Area Network (LAN) shall be either a 10 or 100 Mpbs Ethernet network supporting Java, XML, HTTP, and CORBA IIOP for maximum flexibility for integration of building data with enterprise information systems and providing support for multiple Universal Network Controllers (UNC's), user workstations and a local host computer system.

C. The Enterprise Ethernet (IEEE 802.3) LAN shall utilize Carrier Sense Multiple/Access/Collision Detect (CSMA/CD), Address Resolution Protocol (ARP) and User Datagram Protocol (UDP) operating at 10 or 100 Mbps.

D. The system will consist of an architecture that utilizes a RS-485 19.2/9600 Baud protocol, as the common communication protocol between all controllers.

E. Complete temperature control system to be DDC with electronic sensors and electronic/electric actuation of Mechanical Equipment Room (MER) valves and dampers and electronic actuation of terminal equipment valves and actuators as specified herein.
   1. The supplied system must incorporate the ability to access all data using Java enabled browsers without requiring proprietary operator interface and configuration programs.
   2. An Open Database Connectivity (ODBC) or Structured Query Language (SQL) compliant server database is required for all system database parameter storage.
      a. This data shall reside on a supplier-installed server for all database access.
      b. Systems requiring proprietary database and user interface programs shall not be acceptable.
      c. A hierarchical topology is required to assure reasonable system response times and to manage the flow and sharing of data without unduly burdening the customer's internal Intranet network.
      d. Systems employing a "flat" single tiered architecture shall not be acceptable.

F. All work described in this section shall be installed, wired, circuit tested and calibrated by factory certified technicians qualified for this work and in the regular employment of Control Contractors Inc. The control contractor shall provide documentation in the bid and submittal package verifying longevity of the installing company's relationship with the manufacturer. Supervision, calibration and checkout of the system shall be by the employees of Control Contractors Inc. Supplier shall have an in place support facility within 250 miles of the site with technical staff, spare parts inventory and all necessary test and diagnostic equipment.

1.05 INSTALLATION OF PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION.

A. Section 15540 – HVAC Pumps.
   1. Control Valves.
   2. Flow Switches.
   3. Temperature Sensor Wells and Sockets.
   4. Flow meters.

1.06 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION.

A. Section 15730 – Heat Recovery Ventilator.
   1. Thermostats.

1.07 PRODUCTS NOT FURNISHED OR INSTALLED BUT INTEGRATED WITH THE WORK OF THIS SECTION

A. Section 15556 – Cast Iron Boilers.
   1. Boiler Controls.

B. Section 16480 – Low Voltage Motor Control Centers.

1.08 SUBMITTALS.

A. In accordance with the requirement of Section 01300, submit the following Project Data:
   1. Manufacturer's technical literature for each control device. Indicate dimensions, capacities, performance characteristics, electrical characteristics, finishes for materials, and installation and startup instructions for each type of product indicated.
      a. Each control device labeled with setting or adjustable range of control.
   2. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
      a. Schematic flow diagrams showing fans, pumps, coils, dampers, valves, and control devices.
      b. Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.
      c. Details of control panel faces, including controls, instruments, and labeling.
      d. Written description of sequence of operation.
      e. Schedule of valves including close-off and flow characteristics.
      f. Trunk cable schematic showing programmable control unit locations and trunk data conductors.
      g. Listing of connected data points, including connected control unit and input device.
      h. System graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations.
      i. System configuration showing peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.
   3. Software and Firmware Operational Documentation: Include the following.
      a. Engineering, Installation, Operation and Maintenance manuals.
      b. Program Software Backup: On a magnetic media or compact disc, complete with data files.
      c. Device address list.
      d. Printout of software application and graphic screens.
      e. Licenses, guarantee, and warranty documents for all equipment and systems.
   4. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

5. Maintenance Data: For systems to include in maintenance manuals specified in Division 1. Include the following.
   a. Maintenance instructions and lists of spare parts for each type of control device and compressed air station.
   b. Interconnection wiring diagrams with identified and numbered system components and devices.
   c. Keyboard illustrations and step-by-step procedures indexed for each operator function.
   d. Inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.
   e. Calibration records and list of set points.
6. Qualification Data: For firms and persons specified in "Quality Assurance" Article.
7. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors. Revise Shop Drawings to reflect actual installation and operating sequences.

1.09 QUALITY ASSURANCE.

A. DDC control system shall be compatible with and an extension of the existing City of Unalaska DDC System. No substitutions.

B. The system manufacturer shall, as a minimum, manufacture and supply the Air Handler Digital Controller, Unitary Digital Controller, Graphical User Interface, damper actuators, and valve actuator assemblies.

C. All work described in this section shall be installed, wired, circuit tested and calibrated by factory certified technicians qualified for this work and in the direct employment of the temperature control system manufacturer.

D. The Building Management System contractor shall have a full service facility within the state of Alaska that is staffed with engineers trained in Integrating Interoperable Systems and technicians fully capable of providing routine and emergency maintenance service on all system components.

E. Mechanical equipment manufacturers desiring to provide DDC type controls as factory mounted equipment, shall provide a separate bid for their products less all controls, actuators, valve assemblies and sensors, which are specified to be provided by the BMS contractor.

F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

G. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilation Systems.".

H. Comply with National Electric Code, UL-916 Energy Management Systems, ULC, FCC Part 15, subpart J, Class B Computing Devices.

1.10 DELIVERY, STORAGE AND HANDLING.

A. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping of control devices to unit manufacturer.

1.11 COORDINATION.

A. Coordinate location of thermostats, humidistats, and other exposed control sensors with plans and room details before installation.

B. Coordinate equipment from other divisions including "Intrusion Detection," "Lighting Controls," "Motor-Control Centers," "Panel boards," and "Fire Alarm" to achieve compatibility with equipment that interfaces with those systems.

C. Coordinate supply of conditioned electrical circuits for control units and operator workstation.

D. Coordinate location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete".

E. Coordinate with the Owner's IT department on locations for UNC's, Ethernet communication cabling and TCP/IP addresses.

1.12 WARRANTY AND MAINTENANCE.

A. All components, system software, and parts furnished and installed by the BMS contractor shall be guaranteed against defects in materials and workmanship for 1 year of substantial completion. Labor to repair, reprogram, or replace these components shall be furnished by the BMS contractor at no charge during normal working hours during the warranty period. Materials furnished but not installed by the BMS contractor shall be covered to the extent of the product only. Installation labor shall be the responsibility of the trade contractor performing the installation. All corrective software modifications made during warranty periods shall be updated on all user documentation and on user and manufacturer archived software disks. The Contractor shall respond to the owner's request for warranty service within 24 hours standard working hours.

1.13 OWNERSHIP OF PROPRIETARY MATERIAL.

A. The owner shall sign a copy of the manufacturer’s standard software and firmware licensing agreement as a condition of this contract. Such license shall grant use of all programs and application software to owner as defined by the manufacturer’s license agreement, but shall protect manufacturer’s rights to disclosure of trade secrets contained within such software. All project developed software and documentation shall become the property of the owner. These include, but are not limited to project graphic images, record drawings, project database, project specific application programming code, and all other associated documentation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide the following:
   1. Electric, Electronic, and DDC Systems:
      a. Schneider Electric Building Systems by CCI Automated Technologies.
      b. No substitutions

2.02 DDC EQUIPMENT

A. DDC control system remote communications shall utilize the existing City of Unalaska host computer and internet connection.

B. GUI Server Application Software: Include the following:
   1. Input/output capability from operator station for monitoring and controlling all of the points listed in the input/output point list. The operator shall be able to monitor and access all points by means of clear concise English names without having to understand or reference hardware point locations or controller programs.
      a. Operating System: The GUI shall run on industry standard operating system.
      b. The GUI shall employ browser-like functionality for ease of navigation. It shall include a tree view (similar to Windows Explorer) for quick viewing of, and access to, the

hierarchical structure of the database. In addition, menu-pull downs, and toolbars shall employ buttons, commands and navigation to permit the operator to perform tasks with a minimum knowledge of the HVAC Control System and basic computing skills. These shall include, but are not limited to, forward/backward buttons, home button, and a context sensitive locator line (similar to a URL line), that displays the location and the selected object identification.

c. Real-Time Displays. The GUI, shall at a minimum, support the following graphical features and functions:
   1) Graphic screens shall be developed using any drawing package capable of generating a GIF, BMP, or JPG file format. Use of proprietary graphic file formats shall not be acceptable. In addition to, or in lieu of a graphic background, the GUI shall support the use of scanned pictures.
   2) Graphic screens shall have the capability to contain objects for text, real-time values, animation, color spectrum objects, logs, graphs, HTML or XML document links, schedule objects, hyperlinks to other URL's, and links to other graphic screens.
   3) Graphics shall support layering and each graphic object shall be configurable for assignment to one a layer. A minimum of six layers shall be supported.
   4) Modifying common application objects, such as schedules, calendars, and set points shall be accomplished in a graphical manner.
   5) Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator.
   6) Holidays shall be set by using a graphical calendar, without requiring any keyboard entry from the operator.

d. Commands to start and stop binary objects shall be done by right-clicking the selected object and selecting the appropriate command from the pop-up menu. No entry of text shall be required.

e. Adjustments to analog objects, such as set points, shall be done by right-clicking the selected object and using a graphical slider to adjust the value. No entry of text shall be required.

f. System Configuration. At a minimum, the GUI shall permit the operator to perform the following tasks, with proper password access:
   1) Create, delete or modify control strategies.
   2) Add/delete objects to the system.
   3) Tune control loops through the adjustment of control loop parameters.
   4) Enable or disable control strategies.
   5) Generate hard copy records or control strategies on a printer.
   6) Select points to be able to be alarmed and define the alarm state.
   7) Select points to be trended over a period of time and initiate the recording of values automatically.

g. On-Line Help. Provide a context sensitive, on-line help system to assist the operator in operation and editing of the system. On-line help shall be available for all applications and shall provide the relevant data for that particular screen. Additional help information shall be available through the use of hypertext. All system documentation and help files shall be in HTML format.

h. Security. Each operator shall be required to log on to that system with a user name and password in order to view, edit, add, or delete data. System security shall be selectable for each operator. The system administrator shall have the ability to set passwords and security levels for all other operators. Each operator password shall be able to restrict the operators' access for viewing and/or changing each system application, full screen editor, and object. Each operator shall automatically be logged off of the system if no keyboard or mouse activity is detected. This auto log-off time

shall be set per operator password. All system security data shall be stored in an encrypted format.

i. System Diagnostics. The system shall automatically monitor the operation of all workstations, printers, modems, network connections, building management panels, and controllers. The failure of any device shall be annunciated to the operator.

j. Alarm Console

1) The system will be provided with a dedicated alarm window or console. This window will notify the operator of an alarm condition, and allow the operator to view details of the alarm and acknowledge the alarm. The use of the Alarm Console can be enabled or disabled by the system administrator.

2) When the Alarm Console is enabled, a separate alarm notification window will supercede all other windows on the desktop and shall not be capable of being minimized or closed by the operator. This window will notify the operator of new alarms and un-acknowledged alarms. Alarm notification windows or banners that can be minimized or closed by the operator shall not be acceptable.

C. Web Browser Clients

1. The system shall be capable of supporting 64 clients using a standard Web browser. Systems requiring additional software (to enable a standard Web browser) to be resident on the client machine are only acceptable if 64 licensed copies of the client machine software are provided, installed, and tested.
2. The Web browser software shall run on any operating system and system configuration that is supported by the Web browser. Systems that require specific machine requirements in terms of processor speed, memory, etc., in order to allow the Web browser to function with the FMCS, shall only be acceptable if 64 workstations or workstation hardware upgrades are provided.
3. The Web browser shall provide the same view of the system, in terms of graphics, schedules, calendars, logs, etc., and provide the same interface methodology as is provided by the Graphical User Interface. Systems that require different views or that require different means of interacting with objects such as schedules, or logs, shall not be permitted.
4. The Web browser client shall support at a minimum, the following functions:
   a. User log-on identification and password shall be required. If an unauthorized user attempts access, a blank web page shall be displayed. Security using Java authentication and encryption techniques to prevent unauthorized access shall be implemented.
   b. Graphical screens developed for the GUI shall be the same screens used for the Web browser client. Any animated graphical objects supported by the GUI shall be supported by the Web browser interface.
   c. HTML programming shall not be required to display system graphics or data on a Web page. HTML editing of the Web page shall be allowed if the user desires a specific look or format.
   d. Storage of the graphical screens shall be in the Building Control Units (BC), without requiring any graphics to be stored on the client machine. Systems that require graphics storage on each client are not acceptable.
   e. Real-time values displayed on a Web page shall update automatically without requiring a manual “refresh” of the Web page.
   f. User’s shall have administrator-defined access privileges. Depending on the access privileges assigned, the user shall be able to perform the following:
   g. Modify common application objects, such as schedules, calendars, and set points in a graphical manner.
      1) Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator.

2) Holidays shall be set by using a graphical calendar, without requiring any keyboard entry from the operator.

h. Commands to start and stop binary objects shall be done by right-clicking the selected object and selecting the appropriate command from the pop-up menu. No entry of text shall be required.
i. View logs and charts
j. View and acknowledge alarms
k. The system shall provide the capability to specify a user's (as determined by the log-on user identification) home page. Provide the ability to limit a specific user to just their defined home page. From the home page, links to other views, or pages in the system shall be possible, if allowed by the system administrator.
l. Graphic screens on the Web Browser client shall support hypertext links to other locations on the Internet or on Intranet sites, by specifying the Uniform Resource Locator (URL) for the desired link.

D. Control Units General:
1. Provide an adequate number of control units to achieve monitoring and control of all data points specified and necessary to satisfy the sequence of operation for all mechanical systems shown on the plans. Provide a minimum of one separate controller for each AHU or other HVAC system. Multiple DDC controllers may control one system provided that all points associated with individual control loops are assigned to the same DDC controller. Points used for control loop reset such as outside air or space temperature are exempt from this requirement. Each of the following panel types shall meet the following requirements.
2. Controllers shall be suitable for the anticipated ambient conditions.
a. Controllers used outdoors and/or in wet ambient conditions shall be mounted within waterproof enclosures, and shall be rated for operation at -40°F to 140°F and 5 to 95% RH, non condensing.
b. Controllers used in conditioned ambient space shall be mounted in dustproof enclosures, and shall be rated for operation at 32°F to 122°F and 5 to 95% RH, non-condensing.
3. Serviceability: Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to field-removable, modular terminal strips or to a termination card connected by a ribbon cable.
4. Memory: The Control Units shall maintain all BIOS and programming information in the event of a power loss.
5. Diagnostics: The Building Controller shall continually check the status of its processor and memory circuits. If an abnormal operation is detected, the controller shall assume a predetermined failure mode and generate an alarm notification.
6. Immunity to power and noise: Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 3 ft.
7. Automatic staggered restart of field equipment after restoration of power and short cycle protection.

E. Universal Network Controllers (UNC)
1. The Universal Network Controllers (UNC) shall provide the interface between the LAN or WAN and the field control devices, and provide global supervisory control functions over the control devices connected to the UNC. It shall be capable of executing application control programs to provide:
a. Calendar functions
b. Scheduling
c. Trending

d. Alarm monitoring and routing
e. Time synchronization by means of an Atomic Clock Internet site including automatic synchronization

2. The Universal Network Controller must provide the following hardware features as a minimum:
   a. One Ethernet Port – 10/100 Mbps
   b. One RS-232 port
   c. One RS-232/RS485 port selectable
   d. One LonWorks Interface Port – 78KB FTT-10A with Weidmuller connector
   e. Power supply 24 VAC or 24 VDC
   f. Battery Backup
   g. Real-time clock
   h. Processor @ 200 MHz or greater
   i. 8 Mb flash memory for long term data backup (If battery backup or flash memory is not supplied, the controller must contain a hard disk with at least 1 gigabyte storage capacity)
   j. 64 Mb Ram or greater
3. The UNC shall provide multiple user access to the system and support for ODBC or SQL. A database resident on the UNC shall be an ODBC compliant database or must provide an ODBC data access mechanism to read and write data stored within it.
4. The UNC shall support standard Web browser access via the Intranet/Internet. It shall support a minimum of 64 simultaneous users.
5. Event Alarm Notification and actions
   a. The UNC shall provide alarm recognition, storage; routing, management, and analysis to supplement distributed capabilities of equipment or application specific controllers.
   b. The UNC shall be able to route any alarm condition to any defined user location whether connected to a local network or remote via dial-up telephone connection, or wide-area network.
   c. Alarm generation shall be selectable for annunciation type and acknowledgement requirements including but limited to:
   d. To alarm
   e. Return to normal
   f. To fault
   g. Provide for the creation of a minimum of eight of alarm classes for the purpose of routing types and or classes of alarms, i.e.: security, HVAC, Fire, etc.
   h. Provide timed (schedule) routing of alarms by class, object, group, or node.
   i. Provide alarm generation from binary object “runtime” and /or event counts for equipment maintenance. The user shall be able to reset runtime or event count values with appropriate password control.
   j. Control equipment and network failures shall be treated as alarms and annunciated.
   k. Alarms shall be annunciated in any of the following manners as defined by the user:
   l. Screen message text
   m. Email of the complete alarm message to multiple recipients. Provide the ability to route and email alarms based on:
      1) Day of week
      2) Time of day
      3) Recipient
   n. Pagers via paging services that initiate a page on receipt of email message
   o. Graphic with flashing alarm object(s)
   p. Printed message, routed directly to a dedicated alarm printer
   q. The following shall be recorded by the UNC for each alarm (at a minimum):
   r. Time and date
   s. Location (building, floor, zone, office number, etc.)

t. Equipment (air handler #, accessway, etc.)
u. Acknowledge time, date, and user who issued acknowledgement.
v. Number of occurrences since last acknowledgement.
w. Alarm actions may be initiated by user defined programmable objects created for that purpose.
x. Defined users shall be given proper access to acknowledge any alarm, or specific types or classes of alarms defined by the user.
y. A log of all alarms shall be maintained by the UNC and/or a server (if configured in the system) and shall be available for review by the user.
z. Provide a "query" feature to allow review of specific alarms by user defined parameters.
aa. A separate log for system alerts (controller failures, network failures, etc.) shall be provided and available for review by the user.
bb. An Error Log to record invalid property changes or commands shall be provided and available for review by the user.

6. Data Collection and Storage
   a. The UNC shall have the ability to collect data for any property of any object and store this data for future use.
   b. The data collection shall be performed by log objects, resident in the UNC that shall have, at a minimum, the following configurable properties:
   c. Designating the log as interval or deviation.
   d. For interval logs, the object shall be configured for time of day, day of week and the sample collection interval.
   e. For deviation logs, the object shall be configured for the deviation of a variable to a fixed value. This value, when reached, will initiate logging of the object.
   f. For all logs, provide the ability to set the maximum number of data stores for the log and to set whether the log will stop collecting when full, or rollover the data on a first-in, first-out basis.
   g. Each log shall have the ability to have its data cleared on a time-based event or by a user-defined event or action.
7. All log data shall be stored in a relational database in the UNC and the data shall be accessed from a server (if the system is so configured) or a standard Web Browser.
8. All log data, when accessed from a server, shall be capable of being manipulated using standard SQL statements.
9. All log data shall be available to the user in the following data formats:
   a. HTML
   b. XML
   c. Plain Text
   d. Comma or tab separated values
10. Systems that do not provide log data in HTML and XML formats at a minimum shall provide as an alternative Microsoft SQL Server, Oracle 8i or Express, Hyperion Solutions™ SQL Server.
11. The UNC shall have the ability to archive its log data either locally (to itself), or remotely to a server or other UNC on the network. Provide the ability to configure the following archiving properties, at a minimum:
    a. Archive on time of day
    b. Archive on user-defined number of data stores in the log (buffer size)
    c. Archive when log has reached it's user-defined capacity of data stores
    d. Provide ability to clear logs once archived
12. AUDIT LOG
    a. Provide and maintain an Audit Log that tracks all activities performed on the UNC. Provide the ability to specify a buffer size for the log and the ability to archive log based on time or when the log has reached it's user-defined buffer size. Provide the

ability to archive the log locally (to the UNC), to another UNC on the network, or to a server. For each log entry, provide the following data:

b. Time and date
c. User ID
d. Change or activity: i.e., Change setpoint, add or delete objects, commands, etc.

13. DATABASE BACKUP AND STORAGE
    a. The UNC shall have the ability to automatically backup its database. The database shall be backed up based on a user-defined time interval.
    b. Copies of the current database and, at the most recently saved database shall be stored in the UNC. The age of the most recently saved database is dependent on the user-defined database save interval.
    c. The UNC database shall be stored, at a minimum, in XML format to allow for user viewing and editing, if desired. Other formats are acceptable as well, as long as XML format is supported.

F. Air Handler Digital Controller (AHDC)

1. Microprocessor based, Air Handler Digital Controllers (AHDCs). AHDCs shall be provided for Air Handling Units, packaged Rooftops, perimeter radiant loops and other applications as shown on the drawings. AHDCs shall be based on a minimum 16-bit microprocessor working from software program memory, which is physically located in the AHDC. The application control program shall be resident within the same enclosure as the input/output circuitry, which translates the sensor signals. All input/output signal conversion shall be performed through a minimum of a 10-bit A to D converter. All input points shall be universal in nature allowing their individual function definition to be assigned through the application software. All unused input points must be available as universally definable at the discretion of the owner. If the input points are not fully universal in nature, unused points must be equal in quantity between Analog Inputs and Digital Inputs.
2. Provide a minimum of one AHDC controller per air handling system as shown on the drawings.
3. Provide and field install all AHDCs specified under this section. Mechanical equipment manufacturers desiring to provide AHDC type controls as factory mounted equipment, shall provide a separate bid for their products less all controls, actuators, valve assemblies and sensors, which are specified to be provided by the BAS/Temperature control contractor.
4. All input/output signals shall be directly hardwired to the AHDC. Troubleshooting of input/output signals shall be easily executed with a volt-ohm meter (VOM). As a result of this intent, it is specified that power line carrier systems, or other systems which command multiple outputs over a single pair of wires, shall not be utilized.
5. AHDCs shall be in continuous direct communication with the network which forms the facility wide Building Automation System. The AHDCs shall communicate with the SDC at a baud rate of not less than 19,200 baud.
6. All control sequences programmed into the AHDC shall be stored in non-volatile memory, which is not dependent upon the presence of a battery, to be retained. Power failures shall not cause the AHDC memory to be lost, nor shall there be any need for batteries to be recharged or replaced to maintain the integrity of the controller database.
7. All control sequences shall be fully programmable at the AHDC, allowing for the creation and editing of an application control sequence, while at the unit. The AHDC shall allow for the creation of unique application control sequences. Systems that only allow selection of sequences from a library or table, are not acceptable.
8. The AHDC shall be provided with an interface port for the HHOT. The interface port shall allow the HHOT to have full functionality as described in the HHOT section of this specification. From the interface port, the HHOT shall be able to directly access any AHDC, UDC or VAVDC in the network.

9. The AHDC shall provide an input/output point trending utility that is capable of accumulating 48 analog point samples and 10 digital point samples, per input/output point. Each sample shall be taken on a user-defined interval, ranging from 1 second to 255 hours per sample. The digital readings shall be on a change of state occurrence for the digital points. All samples shall be recorded with the engineering units for the value, along with a time and date identifier for each sample taken. The samples shall be protected against loss due to power interruptions through a battery or capacitor backup method for a minimum of 30 days.
    a. Systems unable to provide the above capability shall provide for the individual input/output point trending at the SDC. Provide specifics as to how each AHDC point will be trended at the SDC in the Technical Proposal documents. Included in the explanation shall be the sample intervals, the memory allocation in the SDC and the number of AHDCs per SDC that can be expected.
10. The AHDC shall provide LED indication of transmit/receive communications performance, as well as for the proper/improper operation of the controller itself.
11. The AHDC shall be provided with a battery backed time clock that is capable of maintaining the time of day and calendar for up to thirty days, upon loss of power to the AHDC, without loss of setting. The battery for the time clock shall be replaceable by the customer. The AHDC shall be provided with integral time schedules; as a minimum, two seven day schedules with eight on/off periods per day shall be provided. Holiday override of weekly schedules shall be provided for pre-scheduling of holidays, for the year in advance.
12. The AHDC shall be mounted directly in or on the controls compartment of the air handling system. The AHDC shall be provided in a NEMA 1 enclosure to accommodate direct mounting on the equipment to be controlled. The AHDC shall be constructed in a modular orientation such that service of the failed components can be done quickly and easily. The modular construction should limit the quantities of printed circuit boards to a maximum of two. All logic, control system, power supply and input/output circuitry shall be contained on a single plug-in circuit board. When required to replace a printed circuit board, it shall not be necessary to disconnect any field wiring. This shall allow all controls maintenance and troubleshooting to be made while at the air handling unit. The AHDC shall be directly wired to sensory devices, staging relays or modulating valves for heating and cooling.
13. AHDCs shall be rated for service from -40 Deg. F to 140 Deg. F.
14. Submit description of location of AHDCs on all mechanical and air handling equipment in the Technical Proposal.

G. Unitary Digital Controller (UDC)
1. Microprocessor based Unitary Digital Controllers (UDCs). UDCs shall be provided for Unit Ventilators, Fan Coils, Heat Pumps and other applications as shown on the drawings. UDCs shall be based on a minimum 16-bit microprocessor working from software program memory, which is physically located in the UDC. The application control program shall be resident within the same enclosure as the input/output circuitry, which translates the sensor signals. All input/output signal conversion shall be performed through a minimum of a 10-bit A to D converter.
2. Provide one UDC controller per unitary system as shown on the drawings. A Single UDC controller shall not be used to serve more than one unitary system.
3. Provide and install all UDCs specified under this section. Mechanical equipment manufacturers desiring to provide UDC type controls as factory mounted equipment, shall provide a separate bid for their products less all controls, actuators, valve assemblies and sensors, which are specified to be provided by the BAS/Temperature control contractor.
4. All input/output signals shall be directly hardwired to the UDC. Troubleshooting of input/output signals shall be easily executed with a volt-ohm meter (VOM). Power line carrier systems, or other systems which command multiple outputs over a single pair of wires, shall not be utilized.

5. UDCs shall be in continuous, direct communication with the network, which forms the facility wide building automation system. The UDCs shall communicate with the SDC at a baud rate of not less than 9,600 baud.
6. All control sequences programmed into the UDC shall be stored in non-volatile memory, which is not dependent upon the presence of a battery, to be retained. Power failures shall not cause the UDC memory to be lost, nor shall there be any need for batteries to be recharged or replaced to maintain the integrity of the controller database. The UDC shall allow for the creation of unique application control sequences. Systems that allow only selection of sequences from a library or table are not acceptable.
7. All control sequences shall be fully programmable at the UDC, allowing for the creation and editing of an application control sequence, while at the unit. The UDC shall allow for the creation of unique application control sequences. Systems that only allow selection of sequences from a library or table are not acceptable.
8. UDCs shall provide the ability to interface with the HHOT. The interface port shall be provided at the wall sensor or within the unitary equipment, as specified on the plans. The interface port shall allow the HHOT to have full functionality as described in HHOT section of this specification. From the interface port, the HHOT shall be able to directly access any AHDC, UDC or VAVDC in the network.
9. UDCs shall provide an input/output point trending utility that is capable of accumulating 48 analog point samples and 10 digital point samples per input/output point. Each sample shall be taken on a user-defined interval, ranging from 1 second to 255 hours per sample. The digital readings shall be on a change of state occurrence for the digital points. All samples shall be recorded with the engineering units for the value, along with a time and date identifier for each sample taken.
    a. Systems unable to provide the above capability shall provide for the individual input/output point trending at the SDC. Specifics as to how each UDC point will be trended at the SDC shall be provided in the Technical Proposal documents. Included in the explanation shall be the sample intervals, the memory allocation in the SDC and the number of UDCs per SDC that can be expected.
10. UDCs shall provide LED indication of transmit/receive communication performance, as well as for the proper/improper operation of the controller itself.
11. UDCs shall be mounted directly in the controls compartment of the unitary system. The UDC shall be provided with a sheet metal or polymeric enclosure that is constructed of material allowing for the direct mounting within the primary air stream, as defined by UL-465. The direct mounting shall allow all controls maintenance and troubleshooting to be made while at the unitary equipment. The UDC shall be directly wired to sensory devices, staging relays or modulating valves for heating and cooling.
12. UDCs shall be rated for service from 32 Deg. F to 140 Deg. F..
13. Contractor shall submit description of location of UDCs on all mechanical and unitary equipment in the Technical Proposal.

H. LANs:
1. Capacity for a minimum of 64 client workstations connected to multi-user, multitasking environment with concurrent capability to access DDC network or control units.
2. Enterprise Network LAN
    a. Media: Ethernet (IEEE 802.3), peer-to-peer CSMA/CD, operating at 10 or 100 Mbps, cable 10 Base-T, UTP-8 wire, category 5
3. Primary Controller Network LAN
4. Remote Connection
    a. ISDN, ADSL, T1 or dial-up connection, monthly charges paid by building owner

I. Software:
1. Controller and System HVAC Applications

a. Update to latest version of software at Project completion. Include and implement the following capabilities from the control units if documented by the specified sequence of operations:
b. Load Control Programs: Demand limiting, duty cycling, automatic time scheduling, start/stop time optimization, occupied/unoccupied setback/setup, DDC with PID, and trend logging.
c. HVAC Control Programs: Optimal run time, supply-air reset, and enthalpy/economizer switchover.
d. Chiller Control Programs: Chilled water plant optimization with condenser water reset, chilled-water reset, chiller and pump equipment selection and sequencing.
e. Boiler Control Programs: Boiler plant optimization with hot water supply reset, boiler and pump equipment selection and sequencing.
f. Programming Application Features: Include trend point, alarm reporting, alarm lockout, weekly scheduling, staggered start, sequencing, anti-short cycling and calculated point.

2.03 CONTROL PANELS

A. Local Control Panels: Unitized NEMA 12 cabinet with suitable brackets for wall or floor mounting located adjacent to each system under automatic control. Provide common keying for all panels.
1. All control panels shall be manufactured by a UL 508A panel shop and shall be UL listed as an assembly.
2. Fabricate panels of 0.06-inch thick, furniture-quality steel, or extruded-aluminum alloy, totally enclosed, with hinged doors and keyed lock and with manufacturer's standard shop-painted finish.
3. Interconnections between internal and face-mounted devices pre-wired with color-coded stranded conductors neatly installed in plastic troughs and/or tie-wrapped. Terminals for field connections shall be UL Listed for 600-volt service, individually identified per control/interlock drawings, with adequate clearance for field wiring. Control terminations for field connection shall be individually identified per control drawings.
4. Door-Mounted Equipment: Flush-mount (on hinged door) manual switches, including damper-positioning switches, changeover switches, thermometers, and gages.
5. Provide ON/OFF power switch with over-current protection for control power sources to each local panel

2.04 SENSORS

A. General: Sensors shall be of the same manufacture as sensors used in the Owner’s existing system where applicable.

B. Electronic Temperature Sensors: Vibration and corrosion resistant; for wall, immersion, or duct mounting as required.
1. Resistance Temperature Detectors: Platinum, thermistor, or balco
a. Accuracy: Plus or minus 0.2 percent at calibration point; thermistors shall have a maximum 5 year drift of no more than .225°F maximum error of no more than .36°F
b. Wire: Twisted, shielded-pair cable
c. Insertion Elements in Ducts: Single point, 6 inches long; use where not affected by temperature stratification or where ducts are smaller than 4 sq. ft.
d. Averaging Elements in Ducts: 60 inches, long, flexible for use where prone to temperature stratification or where ducts are larger than 4 sq. ft.; 264 inches long, flexible for use where prone to temperature stratification or where ducts are larger than 16 sq. ft; length as required.
e. Insertion Elements for Liquids: Brass socket with minimum insertion length of 2-1/2 inches.

f. Outside-Air Sensors: Watertight inlet fitting, shielded from direct sunlight.
g. Room Security Sensors: Stainless steel cover plate with insulated back and security screws.

2. Humidity Sensors: Bulk polymer sensor element.
   a. Accuracy: 2 percent at 10-90% RH with linear output.
   b. Room Sensors: Range of 0 to 100 percent relative humidity
   c. Duct and Outside-Air Sensors: With element guard and mounting plate, range of 0 to 100 percent relative humidity.
3. Static-Pressure Transmitter: Nondirectional sensor with suitable range for expected input, and temperature compensated.
   a. Accuracy: +/- 1 percent of full scale with repeatability of 0.5 percent.
   b. Output: 4 to 20 mA, 0-5 vDC, 0-10 vDC.
   c. Building Static-Pressure Range: -.1 to .1, -0.25 to 0.25, -.5 to .5, -1.0 to 1.0 IN WC., jumper selectable.
   d. Duct Static-Pressure Range: 0 to 1, 0 to 2.5, 0 to 5, 0 to 10 IN WC., jumper adjustable
4. Pressure Transmitters: Direct acting for gas, liquid, or steam service; range suitable for system; proportional output 4 to 20 mA.
5. Airflow Switch (FS-310 & FS-501): Sail switch type, with adjustable range suitable for application. Dry contact DPDT, rated for 5 A at 120V.

C. Equipment operation sensors as follows:
1. Status Inputs for Fans: Differential-pressure switch with adjustable range of 0 to 5 IN WC
2. Status Inputs for Pumps: Differential-pressure switch piped across pump with adjustable pressure-differential range of 8 to 60 psig.
3. Status Inputs for Electric Motors: Current-sensing relay with current transformers, adjustable and set to 175 percent of rated motor current.

D. Electronic Valve/Damper Position Indication: Visual scale indicating percent of travel and 2- to 10-V dc, feedback signal.

E. Water-Flow Switches: Pressure-flow switches of bellows-actuated mercury or snap-acting type, with appropriate scale range and differential adjustment, with stainless steel or bronze paddle. For chilled-water applications, provide vapor proof type.

F. Air-Flow Switches: Sail switch with snap-acting switch, with appropriate range and differential adjustment with polyester film sail on spring wire frame.

G. Occupancy Sensor: Passive infrared, with time delay, daylight sensor lockout, sensitivity control, and 180-degree field of view with vertical sensing adjustment, for flush mounting.

2.05 THERMOSTATS

A. Combination Thermostat and Fan Switches: Line-voltage thermostat with two-, three-, or four-position, push-button or lever-operated fan switch.
1. Label switches "FAN ON-OFF," "FAN HIGH-LOW-OFF," "FAN HIGH-MED-LOW-OFF." Provide unit for mounting on two-gang switch box.

B. Low-Voltage, On-Off Thermostats: NEMA DC 3, 24-V, bimetal-operated, mercury-switch type, with adjustable or fixed anticipation heater.

C. Line-Voltage, On-Off Thermostats: Bimetal-actuated, open contact or bellows-actuated, enclosed, snap-switch type, or equivalent solid-state type, with heat anticipator, integral manual on-off-auto selector switch.
1. Equip thermostats, which control electric heating loads directly, with off position on dial wired to break ungrounded conductors.
2. Dead Band: Maximum 2°F.

D. Remote-Bulb Thermostats: On-off or modulating type, liquid filled to compensate for changes in ambient temperature, with copper capillary and bulb, unless otherwise indicated.
   1. Bulbs in water lines with separate wells of same material as bulb.
   2. Bulbs in air ducts with flanges and shields.
   3. Averaging Elements: Copper tubing with either single- or multiple-unit elements, extended to cover full width of duct or unit, adequately supported.
   4. Scale settings and differential settings are clearly visible and adjustable from front of instrument.
   5. On-Off Thermostat: With precision snap switches, with electrical ratings required by application.
   6. Modulating Thermostats: Construct so complete potentiometer coil and wiper assembly is removable for inspection or replacement without disturbing calibration of instrument.

E. Fire-Protection Thermostats: UL listed with fixed or adjustable settings to operate at not less than 75°F above normal maximum operating temperature, with the following:
   1. Reset: Manual with control circuit arranged to directly shutdown appropriate equipment and provide remote annunciation at the GUI

F. Room Thermostat Cover Construction:
   1. Set-Point Adjustment: Concealed or exposed
   2. Set-Point Indication: Concealed or exposed
   3. Thermometer: Optional
   4. Color: Neutral
   5. Orientation: Vertical or horizontal

G. Room thermostat accessories include the following:
   1. Insulating Bases: For thermostats located on exterior walls.
   2. Thermostat Guards: As specified in tamper prone areas
   3. Adjusting Key: As required for calibration and cover screws.
   4. Set-Point Adjustment: 1/2-inch diameter, adjustment knob.

H. Electric Low-Limit Duct Thermostat: Snap-acting, single-pole, single-throw, manual- or automatic-reset switch that trips if temperature sensed across any 12 inches of bulb length is equal to or below set point.
   1. Bulb Length: Minimum 20 feet
   2. Quantity: One thermostat for every 20 sq. ft. of coil surface.

I. Electric High-Limit Duct Thermostat: Snap-acting, single-pole, single-throw, manual- or automatic-reset switch that trips if temperature sensed across any 12 inches of bulb length is equal to or above set point.
   1. Bulb Length: Minimum 20 feet.
   2. Quantity: One thermostat for every 20 sq. ft. of coil surface.

J. Heating/Cooling Valve-Top Thermostats: Proportional acting for proportional flow, molded-rubber diaphragm, remote-bulb liquid-filled element, direct and reverse acting at minimum shutoff pressure of 25 psig and cast housing with position indicator and adjusting knob.

2.06 ACTUATORS

A. Electric Motors: Size to operate with sufficient reserve power to provide smooth modulating action or two-position action under all environmental conditions (temperature, low power voltage fluctuations, tight seal damper design, maximum air and water flow forces).
   1. Permanent Split-Capacitor or Shaded-Pole Type: Direct Coupled type actuators. Belimo or equal. Equip spring-return motors with integral spiral-spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.

2. Non-spring Return Motors for Valves Larger than NPS 2-1/2": Size for running torque of 150 in-lbs and breakaway torque of 300 in. in-lbs.
3. Spring-Return Motors for Valves Larger than NPS 2-1/2": Size for running and breakaway torque of 150 in-lbs.
4. Non-spring Return Motors for Dampers Larger than 25 Sq. Ft.: Size for running torque of 150 in. x in/lbs and breakaway torque of 300 in-lbs.
5. Spring-Return Motors for Dampers Larger than 25 Sq. Ft.: Size for running and breakaway torque of 150 in-lbs.

B. Electronic Damper and Valve Actuators: Direct-coupled type non-hydraulic designed for minimum 100,000 full-stroke cycles at rated torque. The actuator shall have rating of not less than twice the thrust needed for actual operation of the damper or valve
1. Coupling: V-bolt and V-shaped, toothed cradle.
2. Overload Protection: Electronic overload or digital rotation-sensing circuitry.
3. Fail-Safe Operation: Mechanical, spring-return mechanism. Provide external, manual gear release on non-spring-return actuators.
4. Actuators shall have the ability to be tandem mounted.
5. All spring-return actuators shall have a manual override. Complete manual override shall take no more than 10 turns.
6. Power Requirements (Two-Position Spring Return): 24V ac or dc, Maximum 10VA.
7. Power Requirements (Modulating): Maximum 15 VA at 24V ac.
8. Proportional Signal: 2- to 10-V dc or 4 to 20 mA, and 2- to 10-V dc position feedback signal.
9. Temperature Rating: -22°F to 140ºF.
10. Run Time: 200 seconds open, 40 seconds closed.
11. All actuators shall have a 5 year warranty
12. Valves:
    a. Size for torque required for valve close off at maximum pump differential pressure (regardless of water loop system pressures).
    b. Valve and Actuators shall come from the factory fully assembled.
    c. Spring Return Manual Override shall come with a 10 Degree Valve Preload to assure tight close off.
13. Dampers:
    a. Size for running torque calculated as follows:
    b. Parallel-Blade Damper with Edge Seals: 7 inch-pounds/sq. ft. of damper.
    c. Opposed-Blade Damper with Edge Seals: 5 inch-pounds/sq. ft. of damper.
    d. Parallel-Blade Damper without Edge Seals: 4 inch-pounds/sq. ft. damper.
    e. Opposed-Blade Damper without Edge Seals: 3 inch-pounds/sq. ft. of damper.
    f. Dampers with 2 to 3 Inches wg. of Pressure Drop or Face Velocities of 1000 to 2500 FPM Multiply the minimum full-stroke cycles above by 1.5.
    g. Dampers with 3 to 4 Inches wg. of Pressure Drop or Face Velocities of 2500 to 3000 FPM Multiply the minimum full-stroke cycles above by 2.0.
    h. Spring Return Manual Override actuators shall a factory set 5 Degree Damper Preload.

2.07 CONTROL VALVES

A. Control Valves: Factory fabricated, of type, body material, and pressure class based on maximum pressure and temperature rating of piping system, unless otherwise indicated.

B. Globe Valves NPS 2" and Smaller: Bronze body, bronze trim, rising stem, renewable composition disc, and screwed ends with backseating capacity repackable under pressure. Valves shall have allowable media temperature of 20°F to 281°F to assure that the valve

packing will have a long life (valves will narrower allowable media temperatures have no reserve packing capability for long term watertight seal).

C. Globe Valves NPS 2-1/2" and Larger: Iron body, bronze trim, rising stem, plug-type disc, flanged ends, and renewable seat and disc.

D. Hydronic system globe valves shall have the following characteristics:
   1. Rating: Class 125 for service at 125 psig. and 250°F operating conditions.
   2. Internal Construction: Replaceable plugs and seats of stainless steel or brass.
      a. Single-Seated Valves: Cage trim provides seating and guiding surfaces for plug on top and bottom of guided plugs.
      b. Double-Seated Valves: Balanced plug; cage trim provides seating and guiding surfaces for plugs on top and bottom of guided plugs.
   3. Sizing: 3 psig. maximum pressure drop at design flow rate.
   4. Flow Characteristics: Two-way valves shall have equal percentage characteristics; three-way valves shall have linear characteristics. Operators shall close valves against pump shutoff head.

E. Terminal Unit Control Valves: Bronze body, bronze trim, two- or three-port as indicated, replaceable plugs and seats, union and threaded ends.
   1. Rating: Class 125 for service at 125 psig. and 250ºF operating conditions.
   2. Sizing: 3 psig. maximum pressure drop at design flow rate, to close against pump shutoff head.
   3. Flow Characteristics: Two-way valves shall have equal percentage characteristics; three-way valves shall have linear characteristics.

2.08 CONTROL CABLE

A. Electronic and Fiber-Optic Cable for Control Wiring: As specified in Division 16 Section "Control/Signal Transmission Media."

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that conditioned power supply is available to control units and operator workstation.

B. Verify that duct, pipe, and equipment mounted devices and wiring are installed before proceeding with installation.

3.02 INSTALLATION

A. Install equipment level and plumb.

B. Install software in control units and operator workstation. Implement all features of programs to specified requirements and as appropriate to sequence of operation.

C. Connect and configure equipment and software to achieve sequence of operation specified.

D. Verify location of thermostats, humidistat, and other exposed control sensors with plans and room details before installation. Locate all 60 inches above the floor.
   1. Install averaging elements in ducts and plenums in crossing or zigzag pattern.

E. Install guards or tamper proof enclosures on thermostats in the following locations:
   1. Entrances.
   2. Public areas.
   3. Where indicated.

F. Install automatic dampers according to Division 15 Section "Ductwork Accessories."

G. Install damper actuators on outside of duct in warm areas, not in locations exposed to outdoor temperatures.

H. Install labels and nameplates to identify control components.

I. Install hydronic instrument wells, valves, and other accessories according to Division 15 Section "HVAC Piping and Pumps."

J. Install duct volume-control dampers according to Division 15 Section “Ductwork Accessories.”

3.03 ELECTRICAL WIRING AND CONNECTION INSTALLATION

A. Install raceways, boxes, and cabinets according to corresponding Division 16 Sections

B. Install building wire and cable according to Division 16 Section "Wires and Cables."

C. Install signal and communication cable according to Division 16 Section "Wires and Cables."
   1. Conceal cable, except in mechanical rooms and areas where other conduit and piping are exposed.
   2. Install exposed cable in raceway.
   3. Install concealed cable in raceway except for accessible ceiling areas.
   4. Bundle and harness multi-conductor instrument cable in place of single cables where several cables follow a common path.
   5. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion. Tie and support conductors.
   6. Number-code or color-code conductors for future identification and service of control system, except local individual room control cables.

D. Connect manual-reset limit controls independent of manual-control switch positions. Automatic duct heater resets may be connected in interlock circuit of power controllers.

E. Connect hand-off-auto selector switches to override automatic interlock controls when switch is in hand position.

3.04 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
   1. Install piping adjacent to machine to allow service and maintenance.

B. Ground equipment.
   1. 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 and UL 486B.

3.05 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including piping and electrical connections. Report results in writing.
   1. Leak Test: After installation, fill system and test for leaks. Repair leaks and retest until no leaks exist.
   2. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove malfunctioning units, replace with new units, and retest.
   3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment, and retest.
   4. Pressure test control for air piping:
      a. Pressure test control air piping at 30 psig. or 1.5 times the operating pressure for 24 hours, with maximum 5 psig. loss.

b. Pressure test high-pressure control air piping at 150 psig. and low-pressure control air piping at 30 psig. for 2 hours, with maximum 1 psig

5. Calibration and test both electric/electronic thermostats by disconnecting input sensors and stimulating operation with compatible signal generator.

B. Replace damaged or malfunctioning controls and equipment.
   1. Start, test, and adjust control systems.
   2. Demonstrate compliance with requirements, including calibration and testing, and control sequences.
   3. Adjust, calibrate, and fine tune circuits and equipment to achieve sequence of operation specified.

C. Verify DDC as follows:
   1. Verify software including automatic restart, control sequences, scheduling, reset controls, and occupied/unoccupied cycles.
   2. Verify operation of operator workstation.
   3. Verify local control units including self-diagnostics.
   4. Verify successful operation when powered by standby generator.

3.06 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain control systems and components.
   1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.
   2. Provide operator training on data display, alarm and status descriptors, requesting data, executing commands, calibrating and adjusting devices, resetting default values, and requesting logs.
   3. Review data in maintenance manuals. Refer to Division 1 Section "Contract Closeout."
   4. Review data in maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data."
   5. Schedule training with Owner, through Architect, with at least seven days' advance notice.

3.07 TRAINING

A. Provide a minimum of 8 hours of on-site or classroom training throughout the contract period for personnel designated by the Owner. Each session shall be a minimum of four hours in length and must be coordinated with the building Owner. Train the designated staff of Owners Representative and Owner to enable them to:
   1. Proficiently operate the system
   2. Understand control system architecture and configuration
   3. Understand DDC system components
   4. Understand system operation, including DDC system control and optimizing routines (algorithms)
   5. Operate the workstation and peripherals
   6. Log on and off the system
   7. Access graphics, point reports, and logs
   8. Adjust and change system set points, time schedules, and holiday schedules
   9. Recognize malfunctions of the system by observation of the printed copy and graphical visual signals
   10. Understand system drawings, and Operation and Maintenance manual
   11. Understand the job layout and location of control components
   12. Access data from DDC controllers
   13. Operate portable operators terminals

END OF SECTION

SECTION 15980

INSTRUMENTATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pressure Gauges for HVAC/Plumbing.

B. Pressure Gauge Taps for HVAC/Plumbing.

C. Thermometers for HVAC/Plumbing.

D. Thermometer Wells for HVAC/Plumbing.

1.02 RELATED SECTIONS

A. Section 15975 – Direct Digital Control System.

B. Section 15985 - Sequence of Operation.

1.03 REFERENCES

A. ASTM E1 - Specification for ASTM Thermometers.

B. ASTM E77 - Verification and Calibration of Liquid-in-Glass Thermometers.

C. AWWA C700 - Cold Water Meters - Displacement Type.

D. AWWA C706 - Direct Reading Remote Registration Systems for Cold Water Meters.

1.04 SUBMITTALS

A. Submit under provisions of Division 1.

B. Product Data: Include list which indicates use, operating range, total range and location for manufactured components.

C. Submit manufacturer's installation instructions under provisions of Division 1.

1.05 PROJECT RECORD DOCUMENTS

A. Submit documents under provisions of Division 1.

B. Accurately record actual locations of instrumentation.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Weiss.

B. Trerice.

C. Marshaltown.

D. Substitutions: In accordance with Division 1.

2.02 PRESSURE GAUGES

A. 4-1/2 inch diameter cast aluminum case, phosphor bronze bourbon tube, rotary bronze movement, brass socket, black figures on white background, one percent mid-scale accuracy, scale calibrated in psi. Model 600C as manufactured by Trerice.

2.03 PRESSURE GAUGE TAPS

A. Gauge Isolation Valve: Lever handle ball valve, forged brass body, chrome plated brass ball, viton o-rings for maximum 150 psig. Model Mini T-82-M as manufactured by Jomar.

B. Needle Valve: Brass for maximum 150 psig. Model 735 as manufactured by Trerice.

C. Pulsation Damper: Pressure snubber, brass with 1/4 inch connections. Series 870 as manufactured by Trerice.

2.04 SOLAR POWERED DIGITAL THERMOMETER

A. Hi-impact ABS case; -50/ 300°F (-45/150° C) swtichable range; 1/2" LCD digits, wide ambient formula display; 1% accuracy; 1/10° between -19.9/199.9 °F (-28/93°C) resolution; 10 Lux (one foot-candle) LUX rating; 10 second update rate; -30/140°F (-35/60°C) ambient operating range; Glass passivated thermistor – NTC sensor. Model Digital Vari-angle as manufactured by Weiss Products.

2.05 THERMOMETER WELLS

A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions and as shown on the drawings.

B. Provide one pressure gauges per pump, installing taps before strainers and on suction and discharge of pump. Pipe to gauge with isolation valve to each tapping.

C. Install pressure gauges with pulsation dampers. Provide needle valve or gauge isolation valve to isolate each gauge.

D. Install thermometers in piping systems in sockets in short couplings Enlarge pipes smaller than 2-1/2 inch for installation of thermometer sockets. Select bulb length to reach centerline of pipe.

E. Install thermometer sockets adjacent to controls system thermostat, transmitter, or sensor sockets.

F. Provide instruments with scale ranges selected according to service with largest appropriate scale.

G. Install gauges and thermometers in locations where they are easily read from normal operating level.

3.02 PRESSURE GAUGE SCHEDULE

LOCATION	SCALE RANGE
Pumps less than 40' TDH	0 - 30 PSIG
Pumps more than 40' TDH	0 - 60 PSIG
Glycol water system	0 - 30 PSIG
Others	As applicable

3.03 SOLAR POWERED DIGITAL THERMOMETER SCHEDULE

LOCATION	SCALE RANGE
Glycol water system	0 - 200° F
Domestic hot water supply and recirc.	0 - 200° F
Others	As applicable

END OF SECTION

SECTION 15985

SEQUENCE OF OPERATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Boiler Control.

B. System Hydronic Pumps.

C. Indirect Water Generator.

D. Domestic Hot Water Circulating Pump

E. Heat Recover Ventilator.

F. Unit Heaters.

G. Fintube Radiation.

H. Unitary Air Conditioner (Ac-1)

I. Toilet Room Exhaust Fan.

J. Battery Room Ventilation Fan.

K. Boiler Room Supply Fan.

L. Chlorine Room Supply Fan.

M. Domestic Water Booster Pump.

N. Snow Melt System.

O. Glycol Mix Tank.

P. Ceiling Fans.

Q. Boiler Emergency Shut Off.

1.02 RELATED SECTIONS

A. Section 15411 – Plumbing and Hydronic Piping.

B. Section 15515 – Hydronic Specialties.

C. Section 15540 – HVAC Pumps.

D. Section 15556 – Cast Iron Boilers.

E. Section 15835 – Terminal Heat Transfer Units.

F. Section 15870 – Power Ventilators.

G. Section 15910 – Ductwork Accessories.

H. Section 15980 – Instrumentation.

I. Section 15990 – Balancing and Testing.

J. Section 15975 – Direct Digital Control System.

1.03 SYSTEM DESCRIPTION

A. This Section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are specified in other Sections.

1.04 SUBMITTALS

A. Submit product data under provisions of Division 01.

B. Submit diagrams indicating mechanical system controlled and control system components. Label with settings, adjustable range of control and limits. Include written description of control sequence.

C. Include flow diagrams for each control system, graphically depicting control logic.

D. Include draft copies of graphic displays indicating mechanical system components, control system components, and controlled function status and value.

1.05 PROJECT RECORD DOCUMENTS

A. Submit documents under provisions of Division 01.

B. Accurately record actual setpoints and settings of controls, including changes to sequences made after submission of shop drawings.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

3.01 BOILER CONTROL (B-1 & B-2) and BOILER PUMPS (CP-1 & CP-2)

A. Alarms:
   1. General boiler alarm (B-1 and B-2).
   2. Low glycol temperature.
   3. Burner failure.

B. Digital Control and Indication:
   1. Boiler running (B-1 and B-2).
   2. HGS header temperature.
   3. HGR header temperature.
   4. Outside air temperature.
   5. CP-1 and CP-2 operation indication.

C. Automated Control:
   1. Boilers to be controlled by a packaged solid state boiler controller which incorporates an outdoor temperature reset schedule.
   2. Boilers fire to maintain HGS header temperature set point. The HGS temperature is reset via outside air temperature. When the outside air temperature is above 50 F the HGS temperature is set to 140 F; when the outside air temperature is below 0 F the HGS temperature is set to 180 F (adjustable).
   3. The boilers fire in a cascading sequence. On a call for heat the lead boiler fires and modulates to 100% fire. If the lead boiler is unable to maintain set point the second boiler fires and modulates to maintain system set point. The lead boiler is automatically changed every 24 hours.
   4. CP-1 and CP-2 shall run as their respective boiler fires.
   5. A bypass flow device shall be installed to allow the pump minimal flow rate without deadheading pump.

3.02 SYSTEM HYDRONIC PUMPS (CP-3 and CP-4)

A. Alarms:
   1. No flow (CP-3 and CP-4)
   2. Low temperature.

B. Digital Control and Indication:
   1. CP-3 and CP-4 H-O-A Control.
   2. CP-3 and CP-4 On-Off Indication.
   3. CP-3 and CP-4 inlet pressure indication.
   4. CP-3 and CP-4 outlet pressure indication.
   5. Lead pump selector.
   6. Individual pump run hour indication.
   7. Lead pump alternator setting (hours of use).

C. Automated Control:
   1. The lead pump shall operate when the outside temperature is below 60 degree F (adjustable). The pumps shall be off when the outside temperature is above 60° F.
   2. Upon failure of the lead pump, delay 30 seconds and the lag pump shall operate.
   3. Alternator: Lead pump operation shall alternate every 200 hours of use (adjustable).
   4. Bypass Flow: 3-way valves in the system shall provide the minimum pump flow.
   5. Pump operation and failure shall be indicated on system graphics.

3.03 INDIRECT HOT WATER GENERATOR (HWG-1 & CP-5)

A. Alarms:
   1. Low domestic hot water temperature (120 F)
   2. High domestic hot water temperature (145 F)

B. Digital Control and Indication:
   1. Domestic hot water temperature indication.

C. Automated Control:
   1. Upon a call for heat from the integral aquastat the 2-way control valve opens and the end switch makes and starts circulation pump CP-5. When stratified the 2-way control valve shall close and CP-5 shall stop.

3.04 DOMESTIC HOT WATER CIRCULATING PUMP (CP-6)

A. Alarms:
   1. No flow.

B. Digital Control and Indication:
   1. H-O-A Control.
   2. On-Off Indication.
   3. CP-6 inlet pressure indication.
   4. CP-6 outlet pressure indication.

C. Automated Control:
   1. Domestic water circulation pumps shall operate continuously during occupied hours and be off during unoccupied hours.
   2. If the return temperature exceeds 120 degree F the pump shall stop and automatically restart when the temperature drops below 105 degrees F (adjustable.).

3.05 HEAT RECOVER VENTILATOR (HRV-1 & HC-2)

A. Alarms:
   1. No flow supply fan.
   2. No flow exhaust fan.
   3. Filter maintenance alarms (pre-filter, return side filter, and final filter).
   4. Low temperature supply air temperature.

B. Digital Control and Indication:
   1. H-O-A Control.
   2. On-Off Indication.
   3. Outside air temperature indication.
   4. Supply air temperature indication.
   5. Return air temperature indication.
   6. Exhaust air temperature indication.
   7. Intake damper position indication.
   8. Exhaust damper position indication.
   9. 3-way valve position indication.
   10. Alarm set points.

C. Automated Control:
   1. The units runs continuously during occupied hours.
   2. On low supply air temperature alarm (initially 40º F, adjustable), delay two minutes, then shut down the HRV and signal an alarm. Provide automatic reset of alarm after five minutes.
   3. Units shall be capable of timed manual over ride (1-hour, adjustable) to operate outside of normal occupied hours. Manual over ride controls installed where indicated on plans.
   4. Intake and exhaust dampers shall open fully when the HRV is commanded to run.
   5. A 3-way control valve on the duct mounted heating coil HC-2 shall modulate to maintain duct discharge air temperature of 75 deg. F.(adjustable) as sensed by a duct mounted temperature sensor.

3.06 UNIT HEATERS (UH-1, UH-2)

A. Alarms:
   1. Low space temperature.

B. Digital Control and Indication:
   1. Space temperature setpoint.
   2. Space temperature indication.
   3. Control valve position indication.

C. Automated Control:
   1. On a call for heat by a space mounted, low voltage thermostat, the fan shall start and the 2-way motorized control valve shall open to maintain set point, initially set to 70 degrees F, adjustable.

3.07 FINTUBE RADIATION (FT-1 & FT-2)

A. Alarms:
   1. Low space temperature.

B. Digital Control and Indication:
   1. Space temperature setpoint.
   2. Space temperature indication.
   3. Control valve position indication.

C. Automated Control:
   1. On a call for heat by a space mounted, low voltage thermostat, the fan shall start and the 2-way motorized control valve shall open to maintain set point, initially set to 70 degrees F, adjustable.

3.08 UNITARY AIR CONDITIONER (AC-1)

A. Alarms:
   1. Server room high temperature (provide DDC alarm and output to SCADA system).

B. Digital Control and Indication:
   1. Server room temperature.

C. Automated Control:
   1. AC unit packaged controls shall cycle the unit on and off as required to maintain room temperature at 80 degree F. DDC system monitors room temperature.
   2. AC-1 controls shall be interlocked with server room fin tube heating to disallow simultaneous operation of heating and cooling systems.

3.09 TOILET ROOM EXHAUST FAN (EF-1)

A. Alarms.
   1. None.

B. Manual Control and Indication:
   1. The fans shall cycle on and off with the local lighting circuit.

3.10 BATTERY ROOM VENTILATION FAN (EF-2)

A. Alarms:
   1. High space temperature.
   2. Low space temperature.
   3. H^2 Alarm (this shall alarm DDC and output to SCADA system).

B. Digital Control and Indication:
   1. H-O-A Control.
   2. On-Off Indication.
   3. Space temperature setpoint.
   4. Space temperature indication.
   5. Damper position indication.

C. Automated Control:
   1. On call for cooling (75 degree F, adjustable) the outside air and exhaust air discharge air dampers shall open and the fan shall start. When satisfied the fan shall stop and the outside air damper and the exhaust air discharge air damper shall be closed.
   2. On H^2 Alarm the outside air and exhaust air discharge air dampers shall open and the fan shall start. When the alarm is cleared the fan shall stop and the outside air damper and the exhaust air discharge air damper shall be closed.

3.11 BOILER ROOM SUPPLY FAN (SF-2)

A. Alarms:
   1. Space high temperature.

B. Digital Control and Indication:
   1. H-O-A Control.
   2. On-Off Indication.
   3. Space temperature indication.

4. Space temperature set point.
5. Damper position indication.

C. Automated Control:
1. On call from the space mounted close-on-rise thermostat (initially set to 80 degree F.) the outside air damper shall open and the fan shall cycle to maintain space temperature. When the fan is off the outside air damper shall be closed.

3.12 CHLORINE ROOM SUPPLY FAN (SF-1, EF-3 & HC-1)

A. Alarms:
1. Space high temperature.
2. Space low temperature.
3. EF-3 Failure.
4. Supply fan SF-1 failure.
5. High chlorine gas concentration.

B. Digital Control and Indication:
1. H-O-A Control.
2. On-Off Indication.
3. Supply air temperature indication.
4. Space temperature set point.
5. Damper position indication.
6. Control valve position indication.

C. Automated Control:
1. Variable speed supply fan SF-1 and exhaust fan EF-3 shall operate continuously to provide a constant ventilation rate of 600 CFM.
2. On detection of chlorine gas by the two space mounted detectors the outside air damper D-4 and the D-6 shall open fully and EF-3 VFD shall modulate the fan to full flow to evacuate the chlorine gas from the space.
3. A 3-way control valve on the duct mounted heating coil HC-2 shall modulate to maintain duct discharge air temperature of 75 deg. F.(adjustable) as sensed by a duct mounted temperature sensor.
4. Dampers shall open fully when respective fan is commanded to run.

3.13 DOMESTIC WATER BOOSTER PUMP (WBP-1)

A. Alarms:
1. None.

B. Manual Control and Indication:
1. None.

C. Automated Control:
1. Packaged controls shall cycle the pump on and off as required to maintain domestic water pressure, initially set at 65 PSI , adjustable.

3.14 SNOW MELT SYSTEM (SMP-1 & SMP-2)

A. Alarms:
1. High Slab Temperature.
2. Low Slab Temperature.
3. Maximum slab $\triangle$T.

B. Manual Control and Indication:
1. Slab temperature indication.
2. Warm Weather Cutoff (WWCO) indication and setpoint initially set to 35°F, adjustable.

3. Cold Weather Cutoff (CWCO) indication and setpoint initially set to 0°F, adjustable.
4. SMP-1 & SMP-2 Pump H-O-A control.
5. SMP-1 & SMP-2 Pump On-Off indication.
6. Snowmelt HGS supply temperature indication.
7. Snowmelt HGR return temperature indication.
8. Snow melt system on indication.
9. Manual snow melt system On-Off and indication.
10. Outdoor temperature indication.
11. Melting surface temperature indication and setpoint adjustment initially set to 39°F, adjustable from 34°F to 44°F
12. Idling surface temperature indication and setpoint adjustment initially set to 30°F, adjustable from 24°F to 35°F with an off setting.
13. Water detection sensitivity indication and setpoint adjustment initially set to 50%, adjustable from 20% to 80%.
14. Maximum slab △T (Maximum Rate of Heat Delivery) indication and setpoint adjustment initially set to 30°F, adjustable from 10°F to 50°F.
15. Alarm setpoints.

C. Digital Control and Indication:
   1. When the slab embedded temperature sensor detects a need for snowmelt, and is not locked out on WWCO or CWCO, the snow melt system pump SMP-1 or SMP-2 shall start.
   2. When snow melting is not required and is not locked out on WWCO or CWCO, the snow melt system shall be in idle mode. The snow melt system pump SMP-1 or SMP-2 shall cycle on and off as required to maintain the idling surface temperature setpoint.
   3. To protect the slab from cracking due to thermal stresses, the control system shall limit the rate of heat applied to the slab through a "△T Max" setting. The △T represents the difference between the slab supply and return fluid temperatures which are measured by the control system. If this temperature difference approaches the "△T Max" setting, the control system shall cycle the radiant system pumps as required to maintain the △T at the "△T Max" setting.

3.15 GLYCOL MIX TANK (GT-1)

A. Alarms:
   1. Low level.

B. Manual Control and Indication:
   1. None.

C. Digital Control and Indication:
   1. Packaged controls shall cycle the pump on and off as required to maintain system pressure (Unit is normally turned off except at initial system fill and after maintenance activities).

3.16 CEILING FANS (CF-1)

A. Alarms:
   1. None

B. Manual Control and Indication:
   1. On-Off Indication

C. Automated Control:
   1. The ceiling fans shall be controlled by a wall-mounted, spring-wound timer switch.

3.17 BOILER EMERGENCY SHUT OFF

A. Boiler Room - Activation of a red emergency stop mushroom switch located at the exit of the room shall shut down boilers B-1 and B-2, boiler circulation pumps shall remain in operation.

END OF SECTION

SECTION 15990

BALANCING AND TESTING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Hydronic Balancing.

B. Air Systems Balancing.

1.02 SCOPE

A. Furnish the professional services of a qualified and approved balancing and testing firm to perform the work of this specification section.

B. The work of this section includes but is not necessarily limited to:
   1. Testing and balancing all fans and all air handling systems.
   2. Testing and balancing liquid heat transfer systems.
   3. Working directly with the control subcontractor to obtain proper system adjustments.

C. The work of this section does not include:
   1. Adjusting burners for proper combustion operation.
   2. Domestic water distribution system adjustment.
   3. Liquid waste transfer system adjustment.
   4. Fire protection systems.

1.03 APPLICABLE CODES AND STANDARDS

A. 1982 SMACNA Manual for the Balancing and Adjustment of Air Distribution Systems.

B. AMCA Publication 203, Field Performance Measurements.

C. American Air Balancing Council (AABC) Recommended Procedures.

D. National Environmental Balancing Bureau (NEBB) Recommended Procedures.

1.04 QUALIFICATION OF THE BALANCING FIRM OR COMPANY

A. Subcontractor minimum qualifications include:
   1. NEBB certified.
   2. Maintain a complete service organization that has operated within Alaska for at least three years prior to bid date of this project.
   3. Demonstrate satisfactory completion of five projects of similar scope in the State of Alaska during the past five years. Provide references if requested.

1.05 TIMING OF WORK

A. Do not begin balancing and testing until the systems, including controls, are completed and in full working order.

B. Schedule the testing and balancing work in cooperation with other trades.

C. Complete the testing and balancing at least one week before the date of substantial completion and before any occupancy occurs.

1.06 CONTRACTOR RESPONSIBILITY TO BALANCING AGENCY

A. Award the test and balance contract to an approved firm or company upon receipt of contract to allow the Balance and Testing Agency to schedule this work in cooperation with other trades involved and comply with completion date.

B. Put all heating, ventilating and air conditioning systems, equipment and controls into full operation for the Balancing Agency and continue the operation of same during each working day of testing balancing.

C. Provide scaffolding, ladders and access to each system for proper testing balancing.

D. Make any changes in pulleys, belts and dampers, or add any dampers as required for correct balance as recommended by the Balance and Testing Agency at no additional cost to the Owner.

1.07 REPORT

A. Certified Reports: Submit testing, adjusting, and balancing reports bearing the signature of the Test and Balance Agency Representative. The reports shall be certified proof that the systems have been tested, adjusted, and balanced in accordance with the referenced standards; are an accurate representation of how the systems have been installed; are a true representation of how the systems are operating at the completion of the testing, adjusting and balancing procedures; and are an accurate record of all final quantities measured, to establish normal operating values of the system. Follow the procedures and format specified below:
   1. Draft Reports: Upon completion of testing, adjusting and balancing procedures, prepare draft reports on the approved forms. Draft reports may be hand written, but must be complete, factual, accurate, and legible. Organize and format draft reports in the same manner specified for the final reports.
   2. Final Reports: Upon verification and approval of the draft report; prepare final reports, typewritten, organized and formatted as specified below.
   3. Report Format: Report forms shall be those standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted and balanced. Bind report forms complete with schematic systems diagrams and other data in reinforced, vinyl, 3-ring binders. Provide a copy of the report in electronic PDF format. Provide binding edge labels with the project identification and a title descriptive of the documents. Divide the contents of the binder into the below listed divisions, separated by divider tabs:
      a. General Information and Summary.
      b. Air Systems.
      c. Hydronic Systems.
      d. Temperature Control Systems.
      e. System Deficiency Reports and Corrective Actions.
   4. Report Contents: Provide the following minimum information, forms and data:
      a. General Information and Summary: Inside cover sheet to identify testing, adjusting, and balancing agency; contractor; owner, architect, engineer and project. Include addresses, contact names and telephone numbers. Also include a certification sheet containing the name, address, telephone number and signature of the Certified Test and Balance Personnel. Include in this division a listing of the instrumentation used for the procedures along with the proof of calibration.
      b. The remainder of the report shall contain the appropriate forms containing as a minimum, the information indicated on the standard report forms prepared by the AABC for each respective item and system. Prepare a schematic diagram for each item of equipment and system to accompany each respective report form.

c. Calibration Reports: Submit proof that all required instrumentation has been calibrated to tolerances specified in the referenced standards, within a period of six months prior to starting the project.
d. Final report shall include written documentation of all final setpoints. This information shall be included in the mechanical O&M manuals. Provide hard copy and electronic PDF version.

1.08 SUBMITTALS

A. Submit in accordance with Division 1.

B. Submit balancing agency qualifications and sample balancing forms.

C. Provide list of equipment to be used and date of last calibration.

D. Submit preliminary balance report a minimum of one week prior to substantial inspection.

E. Submit final balance report with written response to comments.

PART 2 PRODUCTS

2.01 INSTRUMENTS

A. Maintain all instruments accurately calibrated and in good working order. Use instruments with the following minimum performance characteristics.
1. Air Velocity Instruments: Direct reading in feet per minute, 2% accuracy.
2. Static Pressure Instruments: Direct reading in inches water gauge, 2% accuracy.
3. RPM Instruments: Direct reading in revolutions per minute, .5% accuracy; or revolution counter accurate within 2 counts per 1,000.
4. Pressure Readout: Direct reading in feet of water or PSI, .5% accuracy.
5. Temperature Instruments - Direct reading in degrees F, +.5% accuracy.
6. Water Flow Instruments: Differential pressure type; direct reading in feet of water or PSI, 2% accuracy, suitable for readout balancing valve provided.
7. Sound Measuring Instrument: Octave Band Analyzer which essentially complies to AASA Standards SI.6 1960 with a range of 24DB to 150 DB sound pressure level ref. .0002 microbar. Calibrate sound test instrument before use to a closed coupler and a driving loudspeaker that produces a know-sound pressure level at the microphone of the analyzer.

PART 3 EXECUTION

3.01 GENERAL PROCEDURES FOR ALL SYSTEMS

A. Start with new, clean filters. The balancing shall be done by providing approximately 10% more air flow and water flow, etc. than shown on the plans. This will allow performance at the desired level as an approximate average of actual use conditions.

B. In cooperation with the control manufacturer's representative, coordinate adjustments of automatically operated dampers and valves to operate as specified, indicated and/or noted.

C. Use manufacturer's ratings on all equipment to make required calculations.

D. Make final adjustments for each space per heating or cooling comfort requirement. State reason for variance from design CFM, i.e., "too noisy", "drafty", etc.

3.02 REQUIREMENTS FOR ALL AIR HANDLING SYSTEMS

A. Identify each diffuser, grille and register as to location and area.

B. Identify and list size, type and manufacturer of diffusers, grilles, registers and all testing equipment.

C. In readings and tests of diffusers, grilles and registers, include required FPM velocity and required CFM and test CFM after adjustments. If test apparatus is designed to read CFM directly, velocity reading may be omitted. Identify test apparatus used. Identify wide open (W.O.) runs.

D. Check and record the following items:
   1. Air temperatures; mixed air, after coils, outside air, return air and supply air.
   2. Pressure drop at each coil, filter bank, etc.
   3. Operating suction and discharge pressure.
   4. Full nameplate data of all equipment.
   5. Ratio and actual running amperage and voltage of all motors.
   6. Drive data including sheaves and belts and adjustments.

3.03 BALANCING LOW VELOCITY CONSTANT VOLUME DUCTWORK

A. Analyze system and identify major branches. Tabulate design CFM for each branch.

B. Select the branch which appears to be the longest run from the fan or to have the highest static pressure requirements.

C. Adjust other branch dampers or the fan to establish 110% design air flow through the selected branch.

D. Adjust the air flow through each air inlet (exhaust systems) or outlet (supply systems) on the selected branch to within +5% of the requirements so that at least one branch damper serving an inlet (or outlet) is wide open.

E. Proceed to another branch and set up 110% design airflow. Balance each inlet or outlet to within +5% of requirements, again leaving at least one wide open run. Repeat this process until all branches are balanced 110% airflow.

F. Once each branch has been balanced at 110% flow with one wide open run on each branch, balance with branches together, leaving at least one branch damper wide open. At this point, adjust the fan delivery so that each branch is at about 110% design airflow. Adjust the branch dampers so that each inlet (or outlet) in the system is within 10% of the required airflow.

G. Adjust the fan for design airflow.

H. Read and record the airflow at each inlet and outlet.

I. Secure each branch damper and mark the balanced position of the damper quadrant.

J. Test and record entering air temperatures.

K. Test and record leaving air temperatures.

L. Test and record static pressure drop across each filter and coil bank.

3.04 FLUID SYSTEM TESTING AND BALANCING

A. Preparation of system - Phase I:
   1. Complete air balance before beginning fluid balance.
   2. Clean all strainers.
   3. Examine fluid in system to determine if treated and clean.
   4. Check pump rotation.
   5. Verify expansion tanks are not air bound and system full of fluid.
   6. Verify all air vents at high points of fluid systems are installed properly and are operating freely. Make certain all air is removed from circuiting system.

7. Open all valves to full flow position including coil and heater stop valves, close bypass valves and open return line balancing cocks. Set temperature controls so that automatic valves are open to full flow through apparatus.
8. Check and set operating temperature of boilers and heat exchangers to design requirements when balancing by temperature drop.
9. Adjust all flows to 110% of design flows as shown.

B. Test and Balance Procedure - Phase II:
1. Set pumps to proper GPM delivery and set proper GPM delivery in main piping runs from boiler room. Note flow variations for additive alternates.
2. Adjust flow of fluid through primary equipment.
3. Check leaving fluid temperatures and return fluid temperatures and pressure drop through major equipment. Reset to correct design temperatures.
4. Check fluid temperature at inlet side of coils and other heat transfer equipment. Note rise or drop of temperatures from source.
5. Balance each coil and all other heat transfer apparatus in system.
6. Upon completion of flow readings and adjustments, mark all settings and record all data.

C. Test and Balance Procedure - Phase III:
1. After making adjustments to coils and apparatus, recheck settings at pumps and major equipment. Readjust if required.
2. Attach pressure gauges on each coil, then read pressure drop through coil at set flow rate on call for full flow through coil. Set pressure drop across bypass valve to match coil full flow pressure drop. This prevents unbalanced flow conditions when coils are on full bypass.
3. Check and record the following items with flows set at 100% of design.
   a. Inlet and leaving fluid and air temperatures at coils and major equipment.
   b. GPM flow of each coil and major equipment.
   c. Pressure drop of each coil and major equipment.
   d. Pressure drop across bypass valve.
   e. Pump operating suction and discharge pressures and final total developed head.
   f. Pump GPM.
   g. Rated and actual running amperage and voltage of pump motor.
   h. Full nameplate data of all pumps and equipment.
4. Permanently mark adjusted position of all balancing valves. Stamp indicator plate of B & G circuit setters and other balancing valves without memory stop.

END OF SECTION

SECTION 16010

BASIC ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General Requirements specifically applicable to Division 16, in addition to Division 1 provisions.

1.02 WORK SEQUENCE

A. Construct Work in sequence under provisions of Division 1.

1.03 COORDINATION

A. Coordinate the Work specified in this Division under provisions of Division 1.

B. Prepare drawings showing proposed rearrangement of Work to meet job conditions, including changes to Work specified under other Sections. Obtain permission of Owner's representative prior to proceeding.

1.04 FUTURE WORK

A. Provide for future work under requirements of Division 1.

B. Project is designed for future expansion of the electrical system.

1.05 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code, latest adopted edition including all state and local amendments.

B. NECA - Standard of Installation.

C. ANSI/IEEE C2 - National Electrical Safety Code latest adopted edition.

1.06 REGULATORY REQUIREMENTS

A. Conform to ANSI/NFPA 70.

B. Conform to the latest adopted edition of the International Building Code and the International Fire Code including all state and local amendments thereto.

C. Conform to ANSI/IEEE C2.

D. Obtain electrical permits, plan review, and inspections from authority having jurisdiction.

1.07 SUBMITTALS

A. Submit inspection and permit certificates under provisions of Division 1.

B. Include certificate of final inspection and acceptance from authority having jurisdiction.

C. Submittal review is for general design and arrangement only and does not relieve the Contractor from any requirements of Contract Documents. Submittal not checked for quantity, dimension, fit or proper operation. Where deviations of substitute product or system performance have not been specifically noted in the submittal by the Contractor, provisions of a complete and satisfactory working installation is the sole responsibility of the Contractor.

D. In addition to requirements referenced in Division 1, the following is required for work provided under this division of the specification.

1. Provide material and equipment submittals containing complete listings of material and equipment shown on Electrical Drawings and specified herein, in electronic or hard copy format for review. Approved submittals shall be bound in hard cover, loose-leaf binders separate from work furnished under other divisions. Index and clearly identify all material and equipment by item, name or designation used on drawings and in specifications.
2. Submit only pages which are pertinent; mark each copy of standard printed data to identify pertinent products, referenced to Specification Section and Article number. Show reference standards, performance characteristics, and capacities; wiring diagrams and controls; component parts; finishes; dimensions; and required clearances.
3. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the work. Delete or strike out information not applicable.
4. Review submittals prior to transmittal; determine and verify field measurements, field construction criteria, manufacturer's catalog numbers, and conformance of submittal with requirements of Contract Documents.
5. Coordinate submittals with requirements of work and of Contract Documents.
6. Sign or initial each sheet of shop drawings and product data, and each sample label to certify compliance with requirements of Contract Documents. Notify Owner’s representative in writing at time of submittal, of any deviations from requirements of Contract Documents.
7. Do not fabricate products or begin work which requires submittals until return of submittal with Owner acceptance. Non-approved work or materials shall be replaced or repaired at no cost to the Owner.
8. Equipment scheduled by manufacturer's name and catalog designations, manufacturer's published data and/or specification for that item, in effect on bid date, are considered part of this specification. Approval of other manufacturer's item proposed is contingent upon compliance therewith.
9. Submittals for Division 16 shall be complete and submitted at one time. Unless given prior approval, partial submittals will be returned unreviewed.

1.08 SUBSTITUTIONS

A. In accordance with the General Conditions and the General Requirements, Substitution and Product Options, all substitute items must fit in the available space, and be of equal or better quality including efficiency performance, size, and weight, and must be compatible with existing equipment.

1.09 PROJECT RECORD DRAWINGS

A. Maintain project record drawings in accordance with Division 1.

B. In addition to the other requirements, mark up a clean set of drawings as the work progresses to show the dimensioned location and routing of all electrical work which will become permanently concealed. Show routing of work in permanently concealed blind spaces within the building. Show complete routing and sizing of any significant revisions to the systems shown.

C. Provide photo documentation of all underground and other wiring which will be permanently concealed in walls, ceilings and below floors.

D. Record drawing field mark-ups shall be maintained on-site and shall be available for examination of the Owner’s Representative at all times.

1.10 OPERATION AND MAINTENANCE MANUALS

A. Provide operation and maintenance manuals for training of Owner's Representative in operation and maintenance of systems and related equipment. In addition to requirements referenced in Division 1, the following is required for work provided under this section of the specifications.

B. Manuals shall be hard cover, loose-leaf binders with pages reinforced to prevent pullout and shall be separate from work furnished under other divisions. Prepare a separate chapter for instruction of each class of equipment or system. Index and clearly identify each chapter and provide a table of contents.

C. Unless otherwise noted in Division 1, provide one copy of all material for approval. After approval, provide five corrected approved hard copies and one electronic copy in pdf format.

D. The following is the suggested outline for operation and maintenance manuals and is presented to indicate the extent of items required in manuals.
   1. List chapters of information comprising the text. The following is a typical Table of Contents:
      a. Electrical power distribution
      b. Lighting
      c. Fire alarm
      d. Uninterruptible Power Supply
      e. Automatic Transfer Switch
      f. Emergency generator
      g. Security system
      h. Other chapters as necessary
   2. Provide the following items in sequence for each chapter shown in Table of Contents:
      a. Describe the procedures necessary for personnel to operate the system including start-up, operation, emergency operation and shutdown.
         1) Give complete instructions for energizing equipment and making initial settings and adjustments whenever applicable.
         2) Provide default settings and values where applicable.
         3) Give step-by-step instructions for shutdown procedure if a particular sequence is required.
         4) Include test results of all tests required by this and other sections of the specifications.
      b. Maintenance Instructions:
         1) Provide instructions and a schedule of preventive maintenance, in tabular form, for all routine cleaning and inspection with recommended lubricants if required for the following:
            a) Lighting fixtures
            b) Distribution equipment
            c) Fire alarm and detection equipment
            d) Automatic Transfer Switch
            e) Uninterruptible power supply
            f) Standby generator
            g) Security systems
         2) Provide instructions for minor repair or adjustments required for preventive maintenance routines, limited to repairs and adjustments which may be performed without special tools or test equipment and which requires no special training or skills.
         3) Provide manufacturers' descriptive literature including approved shop drawings covering devices used in system, together with illustrations, exploded views, etc. Also include special devices provided by the Contractor.
         4) Provide any information of a maintenance nature covering warranty items, etc., which have not been discussed elsewhere.

5) Include list of all equipment furnished for project, where purchased, technical representative if applicable and a local parts source with a tabulation of descriptive data of all electrical-electronic spare parts and all mechanical spare parts proposed for each type of equipment or system. Properly identify each part by part number and manufacturer.

1.11 DEMONSTRATION OF ELECTRICAL SYSTEMS

A. During substantial completion inspection:
1. Conduct operating test for approval under provisions of Division 1.
2. Demonstrate installation to operate satisfactorily in accordance with requirements of Contract Documents.
3. Should any portion of installation fail to meet requirements of Contract Documents, repair or replace items failing to meet requirements until items can be demonstrated to comply.
4. Have instruments available for measuring light intensities, voltage and current values, and for demonstration of continuity, grounds, or open circuit conditions.
5. Provide personnel to assist in taking measurements and making tests.

1.12 CERTIFICATE OF COMPLETION

A. Submit, at time of request for final inspection, a completed letter in the following format:

I, NAME , of FIRM , certify that the electrical work is complete in accordance with Contract Plans and Specifications, and authorized change orders (copies attached) and will be ready for final inspection as of DATE. I further certify that the following specification requirements have been fulfilled:

1. ____ megger readings performed, __ copies of logs attached.
2. ____ ground tests performed, __ copies of method used and results attached.
3. ____ operating manuals completed, DATE .
   SIGNED .
   Owner's Representative
4. ____ as-built drawings up-to-date and ready to deliver to Architect.
5. ____ fire alarm system final connections, check out and start up completed on DATE by:
   SIGNED .
   Factory Authorized and Trained Technician
6. ____ security system final connections, check out and start up completed on DATE by:
   SIGNED .
   Factory Authorized and Trained Technician
7. ____ UPS system final connections, check out and start up completed on DATE by:
   SIGNED .
   Factory Authorized and Trained Technician
8. ____ Packaged engine generator system final connections, check out and start up completed on DATE by:
   SIGNED .
   Factory Authorized and Trained Technician
9. Instruction of operating personnel completed on DATE by:
   SIGNED .
   Owner's Representative
10. ____ all other tests required by specifications have been performed.
11. ____ all systems are fully operational.
    SIGNED .

1.13 INSTRUCTION OF OPERATING PERSONNEL

A. In accordance with the requirements of Division 1 and this section provide services of qualified representative of supplier of each item or system listed below to instruct designated personnel of Owner in operation and maintenance of item or system.

B. Make instruction when system is complete, of number of hours indicated, and performed at time mutually agreeable.

System or Equipment	Hours of Instruction
Security system	2
Fire alarm system	2
Automatic Transfer Switch	2
Uninterruptible power supply	2
Standby power system	2

C. Certify that an Anchorage, Fairbanks or Seattle based authorized service organization regularly carries complete stock of repair parts for listed equipment or systems, that organization is available and will furnish service within 48 hours after request. Include name, address and telephone number of service organization.

D. Have approved operation and maintenance manuals and parts lists for all equipment on hand at time of instruction.

1.14 ELECTRICAL REFERENCE SYMBOLS

A. The Electrical "Legend" on drawings is standardized version for this project. All symbols shown may not be used on drawings. Use legend as reference for symbols used on plans.

1.15 ELECTRICAL DRAWINGS

A. Drawings are diagrammatic; complimentary to the Architectural drawings; not intended to show all features of work. Install material not dimensioned on drawings in a manner to provide a symmetrical appearance. Do not scale drawings for exact equipment locations. Review Architectural, Structural, and Mechanical Drawings and adjust work to conform to conditions shown thereon. Field verification of dimensions, locations and levels is directed.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. All Materials and Equipment shall be new and shall be listed by Underwriter's Laboratories or equivalent OSHA NRTL listing agency for the use intended.

B. Materials and Equipment shall be acceptable to the authority having jurisdiction as suitable for the use intended when installed per listing and labeling instructions.

C. Corrosive environment of the facility process and coastal location requires non-metallic or stainless steel construction to include enclosures, fasteners, hardware and associated components both within and at the exterior.

D. No materials or equipment containing asbestos in any form shall be used. Where materials or equipment provided by this Contractor are found to contain asbestos such items shall be removed and replaced with non-asbestos containing materials and equipment at no cost to the Owner.

E. In describing the various items of equipment, in general, each item will be described singularly, even though there may be numerous similar items.

PART 3 EXECUTION

3.01 WORKMANSHIP

A. Install Work using procedures defined in NECA Standard of Installation and/or the manufacturer's installation instructions.

3.02 TESTS

A. Notify Owner’s representative at least 72 hours prior to conducting any tests.

B. Following completion of installation, test system ground and all feeders with appropriate meggers, or other approved instruments and methods, to determine ground and insulation resistance values. Submit logs of values obtained, and nameplate data of instruments used prior to final inspection. Include a copy of all data in the power distribution section of the Operation and Maintenance Manuals.

C. Perform additional tests required under other sections of these specifications.

D. Perform all tests in the presence of the Owner's representative.

E. The Contractor shall provide written notification to the Owner's representative and the State Electrical Inspector thirty days in advance of requests for rough-in and substantial completion inspections in the event they desire to be present.

3.03 PENETRATIONS OF FIRE BARRIERS

A. Related information to this section appears in Division 7, Fire Stopping.

B. All holes or voids created to extend electrical systems through fire rated floors, walls or ceiling shall be sealed with an asbestos-free intumescent fire stopping material capable of expanding 8 to 10 times when exposed to temperatures 250º F or higher.

C. Materials shall be suitable for the fire stopping of penetrations made by steel, glass, plastic and shall be capable of maintaining an effective barrier against flame, smoke and gases in compliance with the requirements of ASTM E814 and UL 1479.

D. The rating of the fire stops shall be the same as the time-rated floor, wall or ceiling assembly.

E. Install fire stopping materials in accordance with the manufacturer's instructions.

F. Unless protected from possible loading or traffic, install fire stopping materials in floors having void openings of four (4) inches or more to support the same floor load requirements as the surrounding floor.

G. Seal cable tray penetrations of fire rated floors, walls or ceilings with UL listed, reusable fire stop sealing bags.

END OF SECTION

SECTION 16111

CONDUIT

PART 1 GENERAL

1.01 WORK INCLUDED

A. Rigid metal conduit and fittings.

B. Intermediate metal conduit and fittings.

C. Electrical metallic tubing and fittings.

D. Liquidtight flexible metal conduit and fittings.

E. Non-metallic conduit and fittings.

1.02 RELATED WORK

A. Division 1 - Cutting and Patching.

B. Division 2 - Trenching: Excavation and backfill for conduit and utilities on site.

C. Division 7 - Sheet Metal Flashing and Trim.

D. Division 7 - Sealants.

E. Section 16010 - Basic Electrical Requirements.

F. Section 16190 - Supporting Devices.

1.03 REFERENCES

A. ANSI C80.1 - Rigid Steel Conduit, Zinc-Coated.

B. ANSI C80.3 - Electrical Metallic Tubing, Zinc-Coated.

C. ANSI/NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies.

D. FS WW-C-566 - Specification for Flexible Metal Conduit.

E. NEMA RN 1 - PVC Externally-Coated Galvanized Rigid Steel Conduit and Electrical Metallic Tubing.

F. NEMA TC 2 - Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).

G. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

H. NEMA TC 7 - Smooth-Wall Coilable Polyethylene Electrical Plastic Conduit.

I. UL651B – Continuous Length HDPE Conduit.

PART 2 PRODUCTS

2.01 RIGID METAL CONDUIT AND FITTINGS

A. Rigid Steel Conduit: ANSI C80.1.

B. PVC Externally Coated Conduit: NEMA RN 1; rigid steel conduit with external 40 mil PVC coating and internal galvanized surface.

C. Fittings and Conduit Bodies: ANSI/NEMA FB 1; threaded type with insulated throat bushings, material to match conduit.

2.02 INTERMEDIATE METAL CONDUIT (IMC) AND FITTINGS

A. Conduit: Galvanized steel.

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; use fittings and conduit bodies specified above for rigid steel conduit.

2.03 ELECTRICAL METALLIC TUBING (EMT) AND FITTINGS

A. Use approved only within generator enclosure on this project.

2.04 FLEXIBLE METAL CONDUIT AND FITTINGS

A. Not approved for use on this project.

2.05 LIQUIDTIGHT FLEXIBLE CONDUIT AND FITTINGS

A. Conduit: Flexible metal and non-metallic conduit with PVC jacket.

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel or malleable iron with insulated throat bushings. Die cast fittings are not acceptable.

2.06 PLASTIC CONDUIT AND FITTINGS (PVC)

A. Conduit: NEMA TC 2; Schedule 80 PVC rated for 90º C cable.

B. Fittings and Conduit Bodies: NEMA TC 3.

2.07 PLASTIC CONDUIT AND FITTINGS (HDPE)

A. Conduit: NEMA TC 7; Schedule 80 HDPE conduit rated for 90º C cable.

B. Provide conduit with pullstring installed.

C. Fittings and Conduit Bodies: NEMA TC 7.

PART 3 EXECUTION

3.01 CONDUIT SIZING, ARRANGEMENT, AND SUPPORT

A. Conduit is sized on the drawings for copper conductors with 600 Volt type XHHW insulation unless otherwise noted. If conduit size is not shown on the drawings, size conduit for conductor type installed 3/4 inch minimum size unless approved by engineer.

B. Arrange conduit to maintain headroom and present a neat appearance.

C. Route exposed conduit and conduit above accessible ceilings parallel and perpendicular to walls and adjacent piping. Do not route exposed conduit on floors, roofs, or where means of concealment are present.

D. Paint all exposed conduit to match surface to which it is attached or crosses. Clean greasy or dirty conduit prior to painting in accordance with paint manufacturer's instructions and Division 9 of these specifications.

E. Maintain minimum 6 inch clearance between conduit and piping. Maintain 12 inch clearance between conduit and heat sources such as flues, heating pipes, and heating appliances.

F. Arrange conduit supports to prevent distortion of alignment by wire pulling operations.

G. Group conduit in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps. Provide space for 25 percent additional conduit.

H. Do not fasten conduit with wire or perforated pipe straps. Remove all wire used for temporary conduit support during construction, before conductors are pulled.

3.02 CONDUIT INSTALLATION

A. Install conduit for all systems.

B. Cut conduit square; de-burr cut ends.

C. Bring conduit to the shoulder of fittings and couplings and fasten securely.

D. Use conduit hubs for fastening conduit to cast boxes, and for fastening conduit to sheet metal boxes in damp or wet locations.

E. Install no more than the equivalent of three 90-degree bends between boxes.

F. Use conduit bodies to make sharp changes in direction, as around beams. “Goosenecks” in conduits are not acceptable.

G. Maintain minimum recommended bending radius and internal diameters for conduit bends made in the field.

H. Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture.

I. Install a grounding conductor inside of all conduit.

J. Terminate conduits with insulated throat bushing, connectors or hubs.

K. Provide nylon "jet-line" or approved equal pull string in empty conduit, except sleeves and nipples.

L. Install expansion-deflection joints where conduit crosses building expansion or seismic joints.

M. Unless otherwise noted on drawings, install conduits concealed in offices, server room, and restroom except at surface cabinets, motor and equipment connections and in Mechanical and Electrical Equipment rooms.

N. Stub a minimum of 2 inches above floor all raceways terminated beneath free standing service equipment, pad mounted equipment, etc.

O. Do not install conduit imbedded in spray applied fire proofing. Seal conduit penetrations of fire rated walls, ceilings, floors in accordance with the requirements of Section 16010 and Division 7.

P. Route conduit through roof openings for piping and ductwork where possible; otherwise, route through roof jack with pitch pocket. Coordinate all requirements with Division 7 of these specifications.

Q. Conduit embedded in concrete or solid masonry shall not be larger than 1/3 the thickness of the wall or slab and shall be spaced not less than three diameters apart. No cutting of reinforcing bars shall be permitted unless specifically approved. Should structural members prevent the installation of conduit or equipment, notify the Owner’s representative before proceeding.

R. Use cable sealing fittings forming a watertight nonslip connection to pass cords and cables into conduit. Size cable sealing fitting for the conductor outside diameter. Use Appleton CG series or equal cable sealing fittings.

S. Excavation and backfilling shall be in accordance with these specifications and the applicable portions of Division 2.
   1. Excavate and backfill as necessary for proper installation or work.
   2. Provide bracing and shoring as necessary or required.

3. Compact backfill under footings, floor slabs and paving using materials and methods specified under Division 2, Earthwork.
4. All conduits outside the building perimeter shall be buried a minimum of 30" below grade to the top of the pipe. Bottom of trench shall be smoothed and all rocks and cobbles 3" and larger shall be removed. Conduits shall be bedded in a minimum of 2" of D-1 material. Trench shall be backfilled with engineered fill material per 02316 and compacted.
5. Conduits below slab on grade shall be installed in the top 6" of classified material.
6. Damage to existing underground utilities shall be repaired immediately by the Contractor at no cost to the Owner.

T. Wipe plastic conduit clean and dry before joining. Apply full even coat of cement to entire area that will be inserted into fitting. Let joint cure for 20 minutes minimum.

U. Raceways penetrating vapor barriers or penetrating areas from cold to warm shall be sealed with a non-hardening duct sealing compound to prevent the accumulation of moisture, and shall include a vapor barrier on the outside.

V. All conduit for the telecommunications distribution system shall be installed in accordance with TIA/EIA 569 standards, including the following:
1. Install no more than the equivalent of two 90-degree bends between pull boxes. A third 90-degree bend shall be allowed if the length of run between pull boxes is less than 10 meters (33 feet).
2. Install pull boxes in continuous straight runs of conduit longer than 30 meters (98 feet).
3. Pull boxes shall not be used in lieu of conduit bends. Conduit entry and exit points within pull boxes shall be aligned with each other.
4. Condulets (LB fittings) shall not be installed in any telecommunications raceway.
5. Conduit bending radius shall be a minimum of six times the internal conduit diameter for conduits in trade sizes of 2 inches or smaller. For trade sizes larger than 2 inch, the conduit bending radius shall be ten times the internal conduit diameter.

3.03 CONDUIT SCHEDULE

A. For underground installations more than five feet from a foundation wall use rigid steel conduit, intermediate metal conduit, Schedule 80 plastic conduit, or HDPE conduit.

B. For installations in or under concrete slab or underground within five feet of a foundation wall use rigid steel conduit, intermediate metal conduit, Schedule 80 plastic conduit, or HDPE conduit.

C. Where conduit is installed exposed in electrical room use rigid steel conduit, intermediate metal conduit, or EMT.

D. Where conduit is allowed to be installed exposed, as specified elsewhere in this section, in wet interior locations or outdoor locations utilize schedule 80 PVC conduit.

E. Where conduit is installed concealed in dry interior locations utilize Schedule 80 plastic conduit.

F. Where conduit is allowed to be installed exposed, as specified elsewhere in this section, in dry interior locations utilize Schedule 80 plastic conduit.

G. Provide short extensions (three feet maximum) of Liquidtight flexible conduit and fittings for motors and equipment in damp or wet locations or subject to spilling of liquids as at pumps, in mechanical rooms, boiler rooms, pump rooms, etc.

END OF SECTION

SECTION 16120

WIRE AND CABLE

PART 1 GENERAL

1.01 WORK INCLUDED

A. Building wire.

B. Cable.

C. Wiring connections and terminations.

1.02 REFERENCES

A. NEMA WC 5 - Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

PART 2 PRODUCTS

2.01 BUILDING WIRE

A. Thermoplastic-insulated Building Wire: NEMA WC 5.

B. Feeders and Branch Circuits Larger Than 6 AWG: Copper, stranded conductor, 600 volt insulation, THW, THHN/THWN or XHHW-2 as indicated.

C. Feeders and Branch Circuits 6 AWG and Smaller: Copper conductor, 600 volt insulation, THHN/THWN or XHHW-2. 6 and 8 AWG, stranded conductor; smaller than 8 AWG, solid conductor.

D. Branch Circuit Wire Color Code:
   1. Color code wires by line or phase as follows:
      a. Black, red, blue and white for 120/208V systems.
      b. Brown, orange, yellow and gray for 277/480V systems.
   2. For conductors 8 AWG and smaller, insulation shall be colored. For conductors 6 AWG and larger, identify with colored phase tape at all terminals, splices, and boxes.
   3. When two or more neutrals are installed in one conduit, identify each with the proper circuit number in accordance with Section 16195.
   4. Grounding conductors 8 AWG and smaller shall have green colored insulation. For 6 AWG and larger, use green tape at both ends and at all other visible points in between, including pull and junction boxes.

E. Control Circuits: Copper, stranded conductor 600 volt insulation, XHHW-2. Size shall be coordinated to be no larger than manufacturers' field terminals will accept.

F. Fire Alarm Notification Appliance Circuits: Copper, solid or stranded conductor 600 volt insulation, XHHW-2.

2.02 NONMETALLIC SHEATHED CABLE

A. Not approved for use on this project.

2.03 ARMORED CABLE

A. Not approved for use on this project.

2.04 METAL CLAD CABLE

A. Not approved for use on this project.

2.05 REMOTE CONTROL AND SIGNAL CABLE

A. Control Cable for Class 1 Remote Control and Signal Circuits: Copper conductor, 600 volt insulation, rated 90º C, individual conductors twisted together, shielded, and covered with an overall PVC jacket; UL listed.

B. Control Cable for Class 2 or Class 3 Remote Control and Signal Circuits: Copper conductor, 300 volt insulation, rated 90º C, individual conductors twisted together, shielded or unshielded (as required), and covered with a PVC jacket; UL listed.

2.06 MODULAR WIRING SYSTEMS

A. Not approved for use on this project.

2.07 WIRING CONNECTIONS AND TERMINATIONS

A. For conductors 10 AWG and smaller:
   1. Dry interior areas: Spring wire connectors, pre-insulated “twist-on” rated 105 degrees C per UL 468C. Where stranded conductors are terminated on screw type terminals, install crimp insulated fork or ring terminals. Thomas & Betts Sta-Kon or equal.
   2. Motor connections: Spring wire connectors, pre-insulated “twist-on” rated 105 degrees C per UL 468C.
   3. Wet or exterior: Spring wire connectors, pre-insulated “twist-on”, resin filled rated for direct burial per UL 486D.

B. For conductors 8 AWG and larger:
   1. Bus lugs and bolted connections: 600 V, 90 degrees C., two hole long barrel irreversible compression copper tin plated. Thomas & Betts or approved equal.
   2. Motor connection: 600 V, 90 degrees C., copper tin plated compression motor pigtail connector, quick connect/disconnect, slip on insulator. Thomas & Betts or approved equal.
   3. Two way connector for splices or taps: 600 V, 90 degrees C., compression long barrel, copper tin plated. Thomas & Betts or approved equal.
   4. Insulate all field splices with cambric tape, followed by Scotch 130C or equivalent rubber insulating base covering and Scotch 33+ outer wrap. Vinyl insulating tape is not approved for use on this project.

PART 3 EXECUTION

3.01 GENERAL WIRING METHODS

A. Use no wire smaller than 12 AWG for power and lighting circuits, and no smaller than 18 AWG for control wiring.

B. Use 10 AWG conductor for 20 ampere, 120 volt branch circuit home runs longer than 75 feet and for 20 ampere, 277 volt branch circuit home runs longer than 200 feet.

C. Splice only in junction or outlet boxes.

D. Provide minimum 14” conductor loop in all pull boxes without splices.

E. Neatly train and lace wiring inside boxes, equipment, and panelboards.

F. Make Conductor lengths for parallel circuits equal.

G. Wiring in lighting fixture channels shall be rated for 90º C minimum.

H. Do not share neutral conductors. Provide a dedicated neutral conductor for each branch circuit that requires a neutral.

3.02 WIRING INSTALLATION IN RACEWAYS

A. Pull all conductors into a raceway at the same time. Use UL listed wire pulling lubricant for pulling 4 AWG and larger wires.

B. Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.

C. Do not install XHHW-2 conductors when ambient temperatures are below –5 degrees C (23F) and THHN/THWN conductors when ambient temperatures are below 0 degrees C (32F).

D. Conductors shall be carefully inspected for insulation defects and protected from damage as they are installed in the raceway. Where the insulation is defective or damaged, the cable section shall be repaired or replaced at the discretion of the Owner and at no additional cost to the Owner.

E. Place an equal number of conductors for each phase of a circuit in same raceway or cable.

F. Route conductors from each system in independent raceway system and not intermix in the same raceway, enclosure, junction box, wireway, or gutter as another system unless otherwise shown on the plans.

G. No more than three current carrying conductors shall be installed in any homerun unless otherwise indicated on the drawings. Provide dedicated neutral conductor for each circuit.

H. Completely and thoroughly swab raceway system before installing conductors.

3.03 WIRING CONNECTIONS AND TERMINATIONS

A. Splice only in accessible junction boxes.

B. Thoroughly clean wires before installing lugs and connectors.

C. Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.

D. Terminate spare conductors with wire nuts.

E. Control systems wiring in conjunction with mechanical or miscellaneous equipment, including motor control center, switchboards, etc., to be identified in accordance with wiring diagrams furnished with equipment.

F. Code sound and signal systems wiring and any special equipment in accordance with manufacturer's diagrams or recommendations.

G. Do not exceed manufacturer's recommended pull tensions.

3.04 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Division 1.

B. Inspect wire and cable for physical damage and proper connection.

C. Torque conductor connections and terminations to manufacturer's recommended values.

D. Perform continuity test on all power and equipment branch circuit conductors. Verify proper phasing connections.

3.05 WIRE AND CABLE INSTALLATION SCHEDULE

A. All Locations: Building wire and/or remote control and signal cable in raceways or cable tray.

END OF SECTION

SECTION 16121

MEDIUM-VOLTAGE CABLE AND ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Medium voltage cable and accessories.

1.02 RELATED SECTIONS

A. Division 2.

B. Section 16111 - Conduit.

1.03 REFERENCES

A. ANSI/IEEE C2 - National Electric Safety Code.

B. IEEE 48 - Test Procedures and requirements for High-Voltage Alternating-Current Cable Terminations.

C. ICEA Publication S-68-516 and NEMA WC8 - Ethylene-Propylene-Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

D. ICEA Publication S-66-524 and NEMA WC7 – Crosslinked-thermosetting-polyethylene insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

1.04 STANDARDS

A. ANSI/ICEA S-94-649 for Concentric Neutral Cables Rated 5,000 – 46,000 Volts.

B. AEIC CS6 for Ethylene Propylene Rubber Insulated Shielded Power Cables.

C. AEIC CS5 for Crosslinked Polyethylene Insulated Shielded Power Cables.

1.05 SUBMITTALS

A. Submit product data under the provisions of Division 1.

B. Submit product data indicating cable and accessory construction, materials, and ratings.

C. Submit manufacturer's installation instructions under provisions of Division 1.

D. Submit manufacturer's certificate under provisions of Division 1 that medium voltage cable meets or exceeds specified requirements.

1.06 PROJECT RECORD DOCUMENTS

A. Submit record documents under provisions of Division 1.

B. Accurately record exact sizes and locations of cables.

1.07 QUALITY ASSURANCE

A. Manufacturer: Company specializing in medium voltage cable and accessories with minimum three years documented experience.

B. Installer: Company specializing in installation of medium voltage cable with minimum three years documented experience.

1.08 REGULATORY REQUIREMENTS

A. Conform to ANSI/IEEE C2.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site, store and protect under provisions of Division 1.

B. Accept cable and accessories on site in manufacturer's packages and inspect for damage.

C. Protect cable and accessories from weather by covering with opaque plastic or canvas; provide ventilation to prevent condensation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Rome.

B. Triangle PWC.

C. Alcan.

D. Substitutions: Under provisions of Division 1.

2.02 MEDIUM VOLTAGE CABLE

A. Cable: Single conductor Ethylene-propylene rubber (EPR), insulated power cable rated 15 kV, ungrounded neutral with full concentric neutral and overall jacket for direct burial or installation in raceways and ducts.

B. Conductor: Class B stranded annealed Aluminum 1350.

C. Conductor Shield: Extruded, conducting thermosetting compound, firmly bonded to the insulation and meeting the resistivity requirements of ANSI/ICEA S-94-649

D. Insulation: 220 mil ethylene-propylene-rubber insulation with physical and electrical properties in accordance with ANSI/ICEA S-94-649.

E. Insulation Shield: Free-stripping, extruded thermosetting insulation shield with thickness and resistivity conforming with ANSI/ICEA S-94-694.

F. Concentric Neutral: Annealed, bare copper wires, spirally applied over the extruded insulation shield with uniform spacing between wires. Number and size of wires in accordance with ANSI/ICEA S-94-694.

G. Jacket: Overall insulating, linear low density polyethylene (LLDPE), free stripping jacket having a minimum thickness of 80 mils and complying with ANSI/ICEA S-94-694.

H. Identification: All cable shall be identified by means of surface printing indicating manufacturer, size, metal, insulation type and nominal thickness, voltage rating, year of manufacturer and sequential footing marking.

2.03 MANUFACTURERS - CABLE TERMINATIONS

A. RTE.

B. Substitutions: Under provisions of Division 1.

2.04 CABLE TERMINATIONS

A. Separable Connectors: ANSI C119.2 listed 200 Ampere, 15 kV class, load break separable connector consisting of a bayonet type contact probe, compression type CopperTop terminal fitting and insulated EPDM stress cone/body coated with and oil resistant semi-conductive material that completely shields the entire termination.

B. Minimum Ratings:
   1. Loadmake/Loadbreak Operations: 10 loadbreak operations at 200 Amperes, 14.4 kV phase to phase 80% power factor.
   2. Fault Close-in: 10,000 Amperes RMS symmetrical at 14.4 kV for 10 cycles.
   3. Impulse Voltage: 95 kV.
   4. Withstand Voltage: 34 kV, 60 Hz – one minute, 53 kV, DC – 15 minutes
   5. Corona Voltage Level: 11 kV extinction.
   6. Current Rating: Continuous – 200 Amperes RMS; Momentary – 10,000 Amperes RMS symmetrical for 10 cycles;- 3,500 Amperes RMS symmetrical for 3 seconds.

C. Modular Molded Rubber Termination: IEEE 48; Class 1. Kit form, suitable for use with cable specified, including stress cone, ground clamp, non-tracking rubber skirts, connector, rubber cap, and aerial lug.

D. Cast Epoxy Cable Termination: IEEE 48; Class 1. Kit form, suitable for use with cable specified, including stress cone, shield ground connection, wet porcelain rain shield for outdoor units, epoxy resin molding material, and accessories and molds necessary for proper application.

E. Porcelain Insulator Cable Terminators: IEEE 48; Class 1. Kit form, suitable for use with cable specified.

F. Tape Termination: IEEE 48; Class 1. Kit form, suitable for use with cable specified, including semi-conductive tape, stress control tape, splicing tape, vinyl plastic tape, stress cone, mechanical ground straps, and cable preparation kit.

G. Potheads: IEEE 48; Class 1 termination for one conductor with porcelain insulators, cable connector and aerial lug, sealed cable entrance and support, and insulating compound.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that conduit is ready to receive work. Use mandrel to determine if installed conduit is suitable for use.

B. Verify field measurements are as shown on Drawings.

C. Beginning of installation means installer accepts existing conditions.

3.02 PREPARATION

A. Thoroughly swab conduits to remove foreign material before pulling cables.

3.03 INSTALLATION

A. Install cable and terminations in accordance with manufacturer's instructions and to ANSI/IEEE C2.

B. Ground cable shield at each termination and splice.

C. The cable shall be inspected for visual defects as it is removed from the reel. Defective cable shall be discarded.

D. Coordinate new work with existing systems in use as required.

E. Pull cables using suitable lubricants and cable pulling equipment. Do not exceed cable pulling tensions and bending radius recommended by manufacturer. Where a basket grip has been used to pull the conductors the cable under the grip and one foot preceding it shall be severed and discarded after the pulling operation.

F. Install cable in manholes along those walls providing the longest route and most spare cable lengths. Arrange cable to avoid interference with duct entrances into manhole.

G. Avoid abrasion and other damage to cables during installation.

H. Fireproof cables in manholes using fireproofing tape in half-lapped wrapping extended one inch into ducts.

I. No cable bends shall be made within six inches of a termination.

J. Identify all cables as they are installed. Identification shall be done with a permanent marker on plastic tag or corrosion resistant metal tags. Paper or cloth tags are not acceptable. Writing on plastic tags shall be done in neat, large, block letters. Securely attach tags to cables with tags inside enclosures oriented so they can be read without being touched.

K. Provide a minimum of 24 inches of slack in the cable to allow future retermination of cable.

3.04 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Division 1.

B. All materials and equipment shall be installed in accordance with the recommendations of the manufacturer as approved by the Contracting Officer to conform with the Contract Documents.

C. Use portable covering or shelter when terminations are being prepared. Terminations shall be installed in accordance with the manufacture's instructions. Lubricate all mating surfaces of fitting with a silicone grease before the fittings are connected.

D. Cable splices shall be made by qualified cable splicers in strict accordance with the cable manufacturer's recommendations. Cable joints or splices shall not be installed in runs of 1,000 feet or less or at intervals of less than 1,000 feet in longer runs except as required for taps.

E. Inspect exposed cable sections for physical damage. Verify that cable is connected according to Drawings and that shield grounding, cable support, and terminations are properly installed.

F. After installation of the cable and prior to the high potential test specified below the Contractor shall perform a continuity test on the cable.

G. After successfully performing the continuity test noted above, perform a DC high potential test of each conductor, with other conductors grounded, to NEMA WC8. Apply test voltage to conductors in at least eight equal increments to maximum test voltage. Record leakage current at each increment, allowing for charging current decay. Hold maximum test voltage for ten minutes.

H. Record results of test in tabular form and in plots of current versus voltage for incremental voltage steps, and current versus time (30 second intervals) at maximum voltage.

END OF SECTION

SECTION 16130

BOXES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Wall and ceiling outlet boxes.

B. Pull and junction boxes.

1.02 RELATED WORK

A. Division 7: Sealants

B. Division 8 Access Doors: Wall and ceiling access doors.

C. Section 16160 - Cabinets and Enclosures.

1.03 REFERENCES

A. ANSI/NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers and Box Supports.

B. ANSI/NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

PART 2 PRODUCTS

2.01 OUTLET BOXES

A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1; galvanized steel, with ½ inch male fixture studs where required.

B. Nonmetallic Outlet Boxes: ANSI/NEMA OS 2; thermoset, phenolic with 150°C fire rating.

C. Cast Boxes: Cast ferroalloy, deep type, gasketed cover, threaded hubs. “Bell” boxes are not acceptable.

D. Minimum Size: 4 inches square or octagonal, 2-1/8 inches deep except boxes for telephone, telecommunications or LAN systems shall be 4 inches square, 2-1/8 inches deep. Sheetmetal boxes 3-3/4” x 2” x 2-9/16” deep (16 cubic inches) or 4” octagonal by 2-1/8” deep (21.5 cubic inches); nonmetallic boxes 4” square by 2-1/8 inches deep or octagonal.

2.02 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: ANSI/NEMA OS 1; galvanized steel. Minimum size: 4 inches square, 2-1/8” inches deep.

B. Nonmetallic Boxes: ANSI/NEMA OS2; thermoset, phenolic with 150°C fire rating. Minimum size 4” square by 2-1/8 inches deep or octagonal.

C. Sheet Metal Boxes Larger Than 12 Inches in Any Dimension: Hinged enclosure in accordance with Section 16160.

D. Cast Metal Boxes for Outdoor and Wet Location Installations: NEMA 250; Type 4, flat-flanged, surface-mounted junction box, UL listed as raintight. Galvanized cast iron or copper free cast aluminum box with ground flange, neoprene gasket, and stainless steel cover and screws.

E. Cast Metal Boxes for Underground Installations: NEMA 250; Type 4, outside flanged, recessed cover box for flush mounting, UL listed as raintight. Galvanized cast iron or copper free cast aluminum box and plain cover with neoprene gasket and stainless steel cover screws.

F. Fiberglass Handholes for Underground Installations: Die-molded with pre-cut 6 x 6 inch cable entrance at center bottom of each side; fiberglass weatherproof cover with non-skid finish.

G. Polymer Concrete Junction Boxes for Underground Installations: Polymer concrete consisting of sand and aggregate bound together with a polymer resin. Internal reinforcement shall be provided by means of steel, fiberglass or a combination of the two. The installed enclosure shall be rated for a minimum test load of 7500 pounds distributed over a 10 inch by 10 inch area and used in occasional, non-deliberate vehicular traffic or pedestrian traffic application. All hardware shall be stainless steel.

PART 3 EXECUTION

3.01 COORDINATION OF BOX LOCATIONS

A. Provide electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and code compliance.

B. Electrical box locations shown on Contract Drawings are approximate unless dimensioned. Verify location of floor boxes and outlets in offices and work areas prior to rough-in.

C. Locate and install boxes to allow access. Where installation is inaccessible, coordinate locations and sizes of required access doors with Division 8.

D. Locate and install to maintain headroom and to present a neat appearance.

3.02 OUTLET BOX INSTALLATION

A. Do not install boxes back-to-back in walls. Provide minimum 6 inch separation, except provide minimum 24 inch separation in acoustic-rated and fire rated walls.

B. Provide knockout closures for unused openings.

C. Support boxes independently of conduit.

D. Use multiple-gang boxes where more than one device are mounted together; do not use sectional boxes. Provide barriers to separate wiring of different voltage systems.

E. Install boxes in walls without damaging wall insulation.

F. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.

G. Unless otherwise specifically noted locate outlet boxes for light switches within 6 inches of the door jamb on the latch side of the door.

H. Position outlets to locate luminaires as shown on reflected ceiling plans.

I. In inaccessible ceiling areas, position outlets and junction boxes serving light fixtures within 6 inches of the recessed luminaire they are serving, to be accessible through luminaire ceiling opening.

J. Provide recessed outlet boxes in finished areas; secure boxes to interior wall and partition studs, accurately positioning to allow for surface finish thickness. For outlet boxes in walls with combustible finished surfaces such as wood paneling or fabric wall coverings, position box to be flush with finished surface per NEC requirements.

K. Use stamped steel stud bridges for flush outlets in hollow stud wall, and adjustable steel channel fasteners for flush ceiling outlet boxes.

L. Align wall-mounted outlet boxes for switches, thermostats, and similar devices.

M. Provide cast outlet boxes in exterior and/or wet locations.

3.03 PULL AND JUNCTION BOX INSTALLATION

A. Locate pull boxes and junction boxes above accessible ceilings or in unfinished areas.

B. Support pull and junction boxes independent of conduit.

END OF SECTION

SECTION 16141

WIRING DEVICES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Wall switches.

B. Occupancy Sensors.

C. Receptacles.

D. Device plates and box covers.

1.02 REFERENCES

A. FS W-C-596 - Electrical Power Connector, Plug, Receptacle, and Cable Outlet.

B. FS W-S-896 - Switch, Toggle.

C. NEMA WD 1 - General-Purpose Wiring Devices.

D. NEMA WD 5 - Specific-Purpose Wiring Devices.

1.03 SUBMITTALS

A. Submit product data under provisions of Division 1.

B. Provide product data showing configurations, finishes, dimensions, and manufacturer's instructions.

C. Fixture Compatibility: Submitted occupancy sensors shall have wattage ratings to match the circuits on which they are connected and shall be compatible with submitted lamps and ballasts in the fixtures which they will control.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - WALL SWITCHES.

A. Hubbell.

B. Leviton.

C. Pass & Seymour.

D. Arrow Hart.

E. Bryant.

F. Substitutions: Under provisions of Division 1.

2.02 WALL SWITCHES

A. Wall Switches for Lighting Circuits: NEMA WD 1; and Federal Specification FS W-S-896 AC general use snap switch with toggle handle, rated 20 amperes and 120-277 volts AC. Handle: grey nylon. Hubbell catalog number HBL1221GY and HBL1223GY or approved equal.

B. Pilot Light Type: Lighted handle with load off.

2.03 ACCEPTABLE MANUFACTURERS – OCCUPANCY SENSORS

A. Hubbell.

B. Leviton.

C. Lithonia.

D. Novitas.

E. Wattstopper.

F. Substitutions: Under provisions of Division 1.

2.04 OCCUPANCY SENSORS

A. Wall-Mounted Dual-Technology Occupancy Sensor: Multi-technology PIR and ultrasonic sensor with 1600 sq. ft. coverage area, white housing, self-adjusting settings, automatic dual-mode operation, built-in circadian calendar for testing, red/green LEDs for indication of PIR/ultrasonic motion, and non-volatile memory to retain automatic and manual settings during power outages. Provide specific coverage area and either 180° or 360° coverage patterns, as required in the space to prevent unintentional tripping in adjacent spaces. Sensor shall have four selectable timer settings between 30 seconds and 20 minutes. Sensor shall retain all manually adjusted or “learned” settings in the event of a power outage.

2.05 ACCEPTABLE MANUFACTURERS - RECEPTACLES

B. Hubbell.

C. Leviton.

D. Pass & Seymour.

E. Arrow Hart.

F. Bryant.

G. Substitutions: Under provisions of Division 1.

2.06 RECEPTACLES

H. Convenience and Straight-blade Receptacles: NEMA WD 1, Federal Specification FS W-C-596, and UL 498.

I. Locking-Blade Receptacles: NEMA WD 5.

J. Convenience Receptacle Configuration: NEMA WD 1 and WD 6; Type 5-20R, grey nylon face.

K. Specific-use Receptacle Configuration: NEMA WD 1 or WD 5; type as indicated on Drawings, black phenolic face.

L. GFCI Receptacles: 20A, duplex convenience receptacle with integral class ‘A’ ground fault current interrupter, red LED indicator lamp, and integral lockout function.

M. Weather-Resistant Receptacles: Listed to the weather-resistant supplement of UL498 and complying with the requirements of NEC 406.8.

N. Corrosion resistant NEMA 5-20R receptacles: Hubbell catalog number HBL53CM62 or approved equal.

2.07 ACCEPTABLE MANUFACTURERS – DEVICE PLATES

A. Hubbell.

B. Leviton.

C. Pass & Seymour.

D. Mullberry.

E. Red Dot.

F. Raco.

G. Substitutions: Under provisions of Division 1.

2.08 WALL PLATES

A. Decorative Cover Plate: Smooth 430 or 302 stainless steel with metal counter sunk screws to match device plate.

B. Weatherproof Cover Plate: UL listed, cast aluminum, hinged outlet cover/enclosure, with gasket between the enclosure and the mounting surface, suitable for wet locations while in use.

C. Exposed Work Cover Plate: ½ inch raised, square, pressed, galvanized or cadmium plated steel cover plate supporting devices independent of the outlet box.

3 EXECUTION

3.01 INSTALLATION

A. Install wall switches 48 inches above floor, OFF position down.

B. Unless otherwise noted install wall switches within 6 inches of the door jamb on the strike side.

C. Install grounded circuit conductor at all switch locations.

D. Install convenience receptacles 18 inches above floor, 4 inches above counters or backsplash, grounding pole on bottom.

E. Install specific-use receptacles at heights shown on Contract Drawings.

F. Unless otherwise noted, mounting heights are for finished floor to center line of outlet.

G. Install decorative plates on switch, receptacle, and blank outlets in finished areas.

H. Install galvanized steel plates on outlet boxes and junction boxes in dry interior unfinished areas, above accessible ceilings, and on surface-mounted outlets.

I. Install devices and wall plates flush and level.

J. Ground receptacles to boxes with a grounding wire. Grounding through the yoke or screw contact is not an acceptable alternate to the ground wire.

3.02 OCCUPANCY SENSOR TESTING AND CALIBRATION

A. Set the “Delayed Off” time on all sensors to 30 minutes.

B. Do not activate the “Ambient Light Override” feature on any sensors.

END OF SECTION

SECTION 16160

CABINETS AND ENCLOSURES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Hinged cover enclosures.

B. Cabinets.

C. Terminal blocks and accessories.

1.02 REFERENCES

A. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

B. ANSI/NEMA ICS 1 - Industrial Control and Systems.

C. ANSI/NEMA ICS 4 - Terminal Blocks for Industrial Control Equipment and Systems.

D. ANSI/NEMA ICS 6 - Enclosures for Industrial Control Equipment and Systems.

1.03 SUBMITTALS

A. Submit product data under provisions of Division 1.

B. Shop Drawings for Equipment Panels: Include wiring schematic diagram, wiring diagram, outline drawing and construction diagram as described in ANSI/NEMA ICS 1.

PART 2 PRODUCTS

2.01 HINGED COVER ENCLOSURES

A. Construction: NEMA 250; Type 4X, ABS plastic for interior. NEMA 3R stainless steel for exterior applications.

B. Finish: Manufacturer's standard enamel finish.

C. Covers: Continuous hinge, held closed by flush latch operable by key.

D. Panel for Mounting Terminal Blocks or Electrical Components: 14 gauge stainless steel, white enamel finish.

2.02 TERMINAL BLOCKS AND ACCESSORIES

A. Terminal Blocks: ANSI/NEMA ICS 4; UL listed or NRTL recognized.

B. Power Terminals: Unit construction type, closed-back type, with tubular pressure screw connectors, rated 600 volts.

C. Signal and Control Terminals: Modular construction type, channel mounted; tubular pressure screw connectors, rated 300 volts.

2.03 FABRICATION

A. Shop assemble enclosures and cabinets housing terminal blocks or electrical components in accordance with ANSI/NEMA ICS 6.

B. Provide conduit hubs on enclosures.

C. Provide protective pocket inside front cover with schematic diagram, connection diagram, and layout drawing of control wiring and components within enclosure.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install cabinets and enclosures plumb; anchor securely to wall and structural supports at each corner, minimum.

B. Provide accessory feet for free-standing equipment enclosures.

C. Install trim plumb.

END OF SECTION

SECTION 16190

SUPPORTING DEVICES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Conduit and equipment supports.

B. Fastening hardware.

1.02 RELATED WORK

A. Division 3 Cast-in-Place Concrete. Concrete equipment pads.

1.03 REFERENCES

A. International Building Code (IBC), Chapter 16 – Structural Design.

1.04 SUBMITTALS

A. Submit shop drawings under the provisions of Division 1.

B. Provide structurally engineered shop drawings for seismic restraint of all electrical equipment required by the International Building Code (IBC), Chapters 16, 17, and the Authority Having Jurisdiction. Structural design shall be based on the Seismic Use Category and Seismic Design Category as designated in these chapters.

C. Shop drawings shall be stamped by a professional engineer registered in the State of Alaska.

1.05 COORDINATION

A. Coordinate size, shape and location of concrete pads with Division 3.

1.06 QUALITY ASSURANCE

A. Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

PART 2 PRODUCTS

2.01 CONDUIT SUPPORTS

A. Hanger Rods: Threaded high tensile strength stainless steel with free running threads.

B. Beam Clamps: stainless steel, with tapered hole in base and back to accept either bolt or hanger rod. Set screw: stainless steel.

C. Conduit clamps for trapeze hangers: Stainless steel, notched to fit trapeze with single bolt to tighten.

D. Conduit clamps - general purpose: One-hole stamped stainless steel for surface mounted conduits.

2.02 FORMED STEEL CHANNEL

A. U-Channel Strut: 12-gauge stainless steel.

B. Exterior or Wet Areas: Stainless steel.

2.03 SPRING STEEL CLIPS

A. “Caddy” spring steel electrical support systems, suitable and listed for use for intended application.

B. Provide only where concealed in walls or above ceilings.

2.04 MANUFACTURED SEISMIC RESTRAINT SYSTEMS

A. Pre-approved manufactured seismic restraint systems for all seismic support. Systems to be Superstrut seismic restraint system pre-approval No. R-0003, Kinline pre- approval No. R-0071, or B-Line pre-approval No. R-0114.

2.05 SEISMIC SUPPORT WIRE AND CABLE

A. Aircraft stainless steel cable where exposed.

PART 3 EXECUTION

3.01 INSTALLATION

A. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using precast insert system, expansion anchors, preset inserts, beam clamps, or spring steel clips. Conduit support plates shall not be used to support conduits entering junction or outlet boxes.

B. Use self-drilling anchors or expansion anchor on concrete surfaces; sheet metal screws in sheet metal studs; and wood screws in wood construction.

C. Do not fasten supports to piping, ductwork, or mechanical equipment.

D. Power-driven fasteners are prohibited for tension load applications (such as supporting luminaries or conduit racks from ceiling above). Use drilled-in expansion anchors, or drilled and screw-in anchors such as Kwik-Con II or Tapcon.

E. Do not penetrate by drilling or screwing into metal roof decking. All penetrations into metal roof decking must be approved by the Owner’s representative in writing.

F. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head stainless steel bolts with spring lock washers under all nuts.

G. In wet locations install free-standing electrical equipment on concrete pads. Pad top shall be a minimum of 3 ½” above the surrounding grade and shall be reinforced in accordance with Division 3 of these specifications. Disconnects and handles shall be no higher than 79 inches above finished grade unless the pad extends to the front working clearance.

H. Install surface-mounted cabinets and panelboards with minimum of four anchors.

I. Bridge studs top and bottom with channels to support flush-mounted cabinets and panelboards in stud walls.

J. Securely fasten fixtures and equipment to building structure in accordance with manufacturer's recommendations and to provide necessary earthquake anchorage.

K. Provide wall attached fixtures and equipment weighing less than 50 pounds with backing plates of at least 1/8" x 10" sheet steel or 2" x 10" fire retardant treated wood securely built into the structural walls. Submit attachment details of heavier equipment for approval.

L. Earthquake Anchorages:

1. Equipment weighing more than 50 pounds shall be adequately anchored to the building structure to resist lateral earthquake forces.
2. Total lateral (earthquake) forces shall be 1.5 times the equipment weight acting laterally in any direction through the equipment center of gravity. Provide adequate backing at structural attachment points to accept the forces involved.

M. For light fixtures installed in exposed areas (i.e. with no ceiling system), provide stainless steel aircraft cable capable of supporting a minimum of 200 pounds. Attach cable to building structure and to each end of the light fixtures.

N. Attach the supporting cables for all pendant fixtures to both the building structure and to the ceiling grid which they pass through.

O. Replace or repair any fireproofing damaged by the installation of supporting equipment or devices.

END OF SECTION

SECTION 16195

ELECTRICAL IDENTIFICATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Nameplates and tape labels.

B. Wire and cable markers.

C. Conduit color-coding.

D. Wire markers.

E. Conduit markers.

F. Underground warning tape.

G. Working clearance striping.

H. Power one-line diagram and panel map.

1.02 RELATED WORK

A. Section 16120 – Wire and Cable.

B. Section 16130 – Boxes.

C. Section 16141 – Wiring Devices

D. Section 16470 – Panelboards

E. Section 16755 – Telecommunications Raceway and Wiring System.

F. Section 16724 – Addressable Fire Alarm and Smoke Detection System.

1.03 SUBMITTALS

A. Division 1 and Section 16010 – Basic Electrical Requirements.

B. Product Data:
   1. Submit manufacturer’s catalog literature for each product required.
   2. Submit electrical identification schedule including list of wording, symbols, letter size, color-coding, tag number, location, and function.

C. Manufacturer's Installation Instructions: Indicate installation instructions, special procedures, and installation.

D. Prior to installation, submit power one-line diagram and panel map for review.

E. Prior to Substantial Completion, submit copies of all panel schedules for review by the Owner. The Owner will note any changes to the room numbers/names and the Contractor shall provide revised typed panel schedules to reflect all changes, at no additional cost to the Owner.

F. Electrical One-Line Diagrams and Panel Maps: Provide two paper hard copies with redline changes and electronically in AutoCAD format, submitted with the O&M manuals.

1.04 ENVIRONMENTAL REQUIREMENTS

A. Install labels and nameplates only when ambient temperature and humidity conditions for adhesive are within range recommended by manufacturer.

PART 2 PRODUCTS

2.01 NAMEPLATES

A. Product Description: Laminated three-layer plastic with engraved white letters on black background. Nameplate for service disconnect shall be engraved white letters on red background.

B. Letter Size:
   1. 1/4-inch high letters for identifying individual panel or equipment.
   2. 1/8-inch high letters for remaining lines with 1/8 inch spacing between lines.

C. Minimum nameplate size: 1/8 inch thick with a consistent length and height for each type of nameplate wherever installed on the project.

2.02 TAPE LABELS

A. Product Description: Adhesive tape labels, with 3/16 inch Bold Black letters on clear background made using Dymo RhinoPro 5000 label printer or approved equal.

B. Embossed adhesive tape will not be permitted for any application.

2.03 WIRE MARKERS

A. Power and Lighting Description: Self-adhesive machine printed tape type or heat shrink labels Brady 19-427 or approved equal wire markers for all neutrals and Phase conductors.

B. Low Voltage System Description: Self-adhesive machine printed tape type or heat shrink labels Brady 19-427 or approved equal labels with unique wire number that is shown on shop drawing for system.

C. Telecommunications Cable Markers: Self-laminating vinyl with translucent band and minimum 1”W x .5”H printable area with matte white finish. Brady #B-427 series or approved equal.

2.04 FIRE ALARM CONDUIT AND BOX IDENTIFICATION

A. Product Description: Red spray paint for fire alarm boxes.

B. Fire alarm conduit shall have red finish, as specified in Section 16111.

2.05 WORKING CLEARANCE STRIPING

A. Product description: 2” wide epoxy yellow paint with 2 inch high block letters within the clearance area to read: “ELECTRICAL CLEARANCE – NO STORAGE WITHIN THIS ZONE”.

2.06 UNDERGROUND WARNING TAPE

A. Product Description: Red, 6-inch wide, detectable.

B. Wording to read “Caution – Buried Electric Line Below”.

2.07 POWER DISTRIBUTION SYSTEM ONE-LINE DIAGRAM AND PANEL MAP

A. Product Description: One-line diagram and building floor plan panel map. One-line diagram shall show the complete building power system for the MDP. Panel map shall show the plan view location of all distribution panels and branch panelboards. Minimum size shall be 11”x17” but larger maps are recommended. All text shall be legible without magnification.

B. Install one-line and panel map behind a Plexiglas cover screwed to wall on four corners, adjacent to the MDP.

PART 3 EXECUTION

3.01 GENERAL INSTALLATION

A. Degrease and clean surfaces to receive nameplates and tape labels.

B. Install nameplates and tape labels parallel to equipment lines.

C. Underground Warning Tape Installation: Install underground warning tape along length of each underground conduit, raceway, or cable 6 to 8 inches below finished grade, directly above buried conduit, raceway, or cable.

3.02 NAMEPLATE INSTALLATION

A. Secure nameplates to equipment fronts using machine screws tapped and threaded into cover, or using rivets. The use of adhesives is not acceptable. Machine screws to not protrude more than 1/16 inch on back side.

B. Service Disconnect Nameplate: Provide nameplate on exterior service disconnect that reads “SERVICE DISCONNECT”.

C. Distribution Panel Nameplates:
   1. Provide overall equipment identification.
      a. Line 1: Distribution panel name.
      b. Line 2: Source which panelboard is fed.
      c. Line 3: Voltage, phase and wire configuration.
      d. Line 4: AIC rating of the panel.
      e. Line 5: Where applicable, indicate that panel is series-rated.
   2. Provide circuit breaker identification for each feeder breaker.
      a. Line 1: Name of panelboard or equipment served.
      b. Line 2: Location of served panelboard.

D. Branch Panelboard Nameplates:
   1. Provide nameplate for each panelboard with the following information:
      a. Line 1: Panelboard name.
      b. Line 2: Source from which the panelboard is fed.
      c. Line 3: Voltage, phase and wire configuration.
      d. Line 4: AIC rating of the panelboard.

E. Transformers:
   1. Provide nameplate for each transformer with the following information:
      a. Line 1: Transformer name.
      b. Line 2: Source from which the transformer is fed.
      c. Line 3: Primary and secondary voltage, phase and wire configuration.
      d. Line 4: Secondary load and location.

F. Disconnects, Starters, or Contactors:
   1. Provide nameplate for each device with the following information:
      a. Line 1: Load served.
      b. Line 2: Panelboard and circuit number from which the device is fed.
      c. Line 3: Fuse or Circuit amperage and poles. Where fused disconnect is installed, denote the maximum fuse size to be installed.

G. Control or Low Voltage System Panels:
   1. Provide nameplate for each control panel with the following information:

a. Line 1: Unique panel name as shown on the shop drawings.
b. Line 2: System description such as Fire Alarm, Intercom, BAS, Security, etc.
c. Line 3: Panelboard and circuit number from which the panel is fed if applicable.

3.03 LABEL INSTALLATION

A. Conduit Feeder Labels - Provide conduit labels on all feeder raceways as follows:
   1. Distribution Panels – "PANEL xxxx IN ROOM #xxx".
   2. Panelboards – "PANEL xxxx FED FROM MDP xxx".

B. Spare Raceways: Provide raceway label on each individual raceway denoting the source and termination point at each end.

C. Fire Alarm Device Labels: As specified in Section 16724.

D. Low-Voltage System Device Labels: Provide label on each device, denoting device ID or address where applicable. Affix label to device faceplate for ceiling-mounted devices or wall-mounted devices above 8'-0" AFF. Affix label inside backbox for exterior devices.

3.04 WIRE IDENTIFICATION

A. Provide wire markers on each conductor in panelboard gutters, pull boxes, outlet and junction boxes, and at load connection. Identification shall be as follows:
   1. Markers shall be located within one inch of each cable end, except at panelboards, where markers for branch circuit conductors shall be visible without removing panel deadfront.
   2. Each wire and cable shall carry the same labeled designation over its entire run, regardless of intermediate terminations.
   3. Color code phases, neutral, and ground per NEC requirements and Section 16120.
   4. Color-code all low-voltage system wires and cables in accordance with the individual sections in which they are specified.
   5. For power and lighting circuits, identify with branch circuit or feeder number.
   6. Control Circuits: Control wire number as indicated on schematic and shop drawings.
   7. Fire Alarm Circuits: Provide cable markers showing NAC or SLC loop identification number at all fire alarm junction boxes and pullboxes.

B. Provide pull string markers at each end of all pull strings. Marker shall identify the location of the opposite end of the pull string.

3.05 JUNCTION BOX IDENTIFICATION

A. Fire Alarm: In accessible ceiling spaces, exposed ceiling spaces, mechanical/electrical rooms, and other non-public spaces, paint fire alarm junction boxes and pullboxes with red spray paint. In all finished spaces where fire alarm boxes are visible, they shall be painted to match the surrounding finish. If there are any questions as to whether fire alarm boxes shall be painted red in a specific area, the Contractor shall get clarification from the Owner prior to painting.

B. Paint all junction boxes designated for future expansion with blue spray paint.

C. Label each lighting and power junction box with the panelboard name and circuit number.

D. Label all junction boxes for security systems with the type of system cables contained in the box.

E. For junction boxes above ceilings, mark the box cover with the circuit or system designation using permanent black marker. For junction boxes in finished areas, mark the inside of the cover with the circuit or system designation using permanent black marker.

3.06 DEVICE PLATE IDENTIFICATION

A. Label each receptacle and switch device plate or point of connection denoting the panelboard name and circuit number.

B. Install adhesive label on the top of each plate.

3.07 PANELBOARD IDENTIFICATION

A. Provide panelboard circuit directories in accordance with Section 16470.

B. Install one-line and panel map adjacent to the MDP.

3.08 LOW-VOLTAGE SYSTEM IDENTIFICATION

A. Install all labeling in accordance with the requirements of this section and of each section where the individual systems are specified.

3.09 WORKING CLEARANCE STRIPING

A. Working clearance striping paint shall be applied in front of panels located in mechanical rooms, electrical rooms, storage rooms, and other non-public areas with exposed concrete floors.

B. Striping paint shall not be applied in front of panels located in corridors and other public spaces, or spaces with finished floor surfaces (e.g., carpet, tile, vinyl, etc.).

3.10 CONDUIT COLOR CODING SCHEDULE

A. Use colored tape to identifying conduit by system.

B. Primary Distribution System: No label.

C. 480 Volt, Three Phase System: Orange.

D. 208 Volt, Single and Three Phase System: White.

E. Use Scotch No. 35 or approved equal color coding tape wrapped a minimum of 6 times around the conduit at each junction or outlet box at intervals on the conduit not to exceed twenty feet on center. Color code conduits as follows:
   1. Fire Alarm System: Red.
   2. Telecommunications System: Blue
   3. Controls System: Green.
   4. Standby Power: Yellow.
   5. Security System: Purple.

F. All conduits entering or leaving a junction box shall be color-coded.

END OF SECTION

SECTION 16420

SERVICE ENTRANCE

PART 1 GENERAL

1.01 WORK INCLUDED

A. Arrangement with Utility Company for permanent electric service.

B. Underground service entrance.

1.02 RELATED WORK

A. Division 3 - Concrete work

1.03 SYSTEM DESCRIPTION

A. System Voltage: 277/480 volts, three phase, four-wire, 60 Hertz.

B. Service Entrance: Underground.

1.04 QUALITY ASSURANCE

A. Utility Company: City of Unalaska.

B. Install service entrance in accordance with Utility Company's rules and regulations.

1.05 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 1.

PART 2 PRODUCTS

2.01 METERING EQUIPMENT

A. Meter: Furnished and installed by the Utility Company.

B. Transformer Rated Meter Base: NEMA 3R, 13-terminal, transformer rated 200 amperes, 600 volts with mounting provisions to accommodate a covered test switch with test switch cover sealing provisions. The test switch mounting provisions shall accept a 10 pole covered test switch with a base dimension of 9.5 inches in width and a depth (the dimension from the rear edge of the test switch base to the top of the cover sealing stud) of no less than 3.375 inches. The lower cover of the meter socket shall seat fully with a covered test switch in place. Meet requirements of NEMA standards for watthour meter sockets-NEMA EI17-1978 (similar to EUSERC Drawing No. 339). The utility company will furnish and install the test switch and CT wiring.

C. Current Transformer Cabinet: NEMA 4X, UL 414 listed, minimum size as shown on the drawings. All current transformer cabinets and compartments shall have hinged front cover access to the current transformers. The hinged front cover shall be lockable and shall accept a padlock with a shackle diameter of not less than 5/16 inch. Current transformer cabinet shall have ¼ x 20 mounting studs on the enclosure body spaced to accept a current transformer mounting base. Enclosure shall accept Utility provided bus bar type 600 Ampere CT's, Itron 600-5 or utility approved equal.

D. All removable covers for compartments containing un-metered conductors shall be sealable or lockable with sealable latches, stud and wing-nuts, sealing screws, or slot and tab devices. All top cover panels, side cover panels and rear cover panels providing access to un-metered conductors shall be secured in place with devices that cannot be loosened from the outside,

screws or bolts requiring special tools for installation or removal are not acceptable alternates. No removable panel or cover requiring sealing or locking shall be located behind other panels, covers or doors except for rain-tight enclosures. Hinged cover panels shall be lockable on the side opposite the hinges. Hinged panel covers shall accept a padlock with a shackle diameter of not less than 5/16 inch. Stud and wing-nut sealing assemblies shall consist of a ¼ inch x 20 (minimum) stud and associated wing-nut, each drilled 0.0635 inch (minimum) for sealing purposes. The stud shall be securely attached so as to not loosen or back out when being fastened. Sealing screws shall be drilled 0.0635 inch (minimum) for sealing purposes. All securing screws for removable panel covers shall be captive.

PART 3 EXECUTION

3.01 INSTALLATION

A. Make arrangements with Utility Company to obtain permanent electric service to the Project.

B. Underground: Install service entrance conduits from Utility Company's pad-mounted transformer to building service entrance equipment. Utility Company will connect service lateral conductors to service entrance conductors and install bus bar CT's and associated metering wiring.

C. Spray all exposed conductor sections and termination lugs with Scotch #1602 Ivi-Spray or approved equal red electrical sealer.

D. Concrete Pad for Transformer: By Contractor.

E. Meter sockets shall be installed with the centerline of the socket opening no more than 72 inches and no less than 60 inches above finished grade. The meter socket shall be installed with a minimum 10 inches of side clearance to each side of the socket. On current transformer rated meter sockets, the conduit connecting the meter socket and the current transformer cabinet shall be rigid steel or IMC and have a minimum diameter of 1 inch, shall not be longer than 25 feet, shall have no access points (junction boxes, condulets, etc.), and shall connect to the meter socket at a factory supplied knockout located below the test switch mounting provisions.

F. Wall mounted current transformer enclosures shall be mounted with the top of the cabinet no more that 96 inches above grade and the bottom of the cabinet no less than 16 inches above grade.

G. Current transformer cabinets shall not be used as a junction point to service other metered services or as a splicing chamber.

H. All service entrance equipment shall have signage for arc hazard installed. The marking shall be located to be clearly visible to qualified personnel before examination, adjustment, servicing or maintenance of the equipment. At a minimum the signage shall state the following:

Warning

Arc Flash and Shock Hazard

Appropriate PPE Required

END OF SECTION

SECTION 16425

SWITCHBOARDS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Main and distribution switchboards.

1.02 RELATED WORK

A. Section 16420 - Electric Service

1.03 REFERENCES

A. ANSI C12 - Code for Electricity Metering.

B. NEMA AB 1 - Molded Case Circuit Breakers

C. NEMA PB 2 - Dead Front Distribution Switchboards.

D. NEMA PB 2.1 - Instructions for Safe Handling, Installation, Operation and Maintenance of Deadfront Switchboards Rated 600 Volts or Less.

1.04 SUBMITTALS

A. Submit product data on all materials included under this section conforming to requirements of Shop Drawings, Product Data and Samples.

B. Include front and side views of enclosures with overall dimensions shown; conduit entrance locations and requirements; nameplate legends; size and number of bus bars per phase, neutral, and ground; instructions for handling and installation of switchboard; and electrical characteristics including voltage, frame size and trip ratings, withstand ratings, and time-current curves of all equipment and components.

1.05 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Division 1.

B. Include spare parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.06 STORAGE AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle in accordance with NEMA PB2.1 and manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

1.07 SPARE PARTS

A. Keys: Furnish 2 each to Owner.

B. Fuses: Furnish to Owner 2 spare fuses of each type and rating installed.

C. Fuse Pullers: Furnish one fuse puller to Owner.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Square D.

B. ITE Siemens-Allis.

C. General Electric.

2.02 SWITCHBOARD CONSTRUCTION AND RATINGS

A. Factory-assembled, dead front, metal-enclosed, and self- supporting switchboard assembly conforming to NEMA PB2, and complete from incoming line terminals to load-side terminations.

B. Switchboard electrical ratings and configurations as required by the load served plus the future expansion.

C. Line and Load Terminations: Accessible from the front only of the switchboard, suitable for the conductor materials used.

D. Main Section Devices: Individually mounted and compartmented.

E. Distribution Section Devices: Panel mounted.

F. Auxiliary Section Devices: Individually mounted and compartmented.

G. Bus Material: Copper with silver plating, sized in accordance with NEMA PB 2.

H. Bus Connections: Bolted, accessible from front for maintenance.

I. Provide a one x ¼ inch copper ground bus through the length of the switchboard.

J. Provide metering transformer compartment for Utility Company's use. Compartment size, bus spacing and drilling, door, and locking and sealing requirements shall be in accordance to Section 16420.

K. Enclosure shall be NEMA PB 2 Type 1 - General Purpose. Sections shall align at front and rear.

L. Switchboard Height: NEMA PB2; excluding floor sills, lifting members and pull boxes.

M. Finish: Manufacturer's standard light gray enamel over external surfaces. Coat internal surfaces with minimum one coat corrosion-resisting paint, or plate with cadmium or zinc.

N. Pull Section: Same construction as switchboard, 18 inch minimum width, depth and height to match switchboard.

O. Future Provisions: Fully equip spaces for future devices with bussing and bus connections, suitably insulated and braced for short circuit currents. Continuous current rating. See Section 16000.

2.03 SWITCHING AND OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers: NEMA AB 1; provide circuit breakers with integral thermal and instantaneous magnetic trip in each pole.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install switchboard in Battery/Electrical Room, in accordance with manufacturer's written instructions and NEMA PB 2.1.

B. Tighten accessible bus connections and mechanical fasteners after placing switchboard.

C. All switchboards shall have signage for arc hazard installed. The marking shall be located to be clearly visible to qualified personnel before examination, adjustment, servicing or maintenance of the equipment. At a minimum the signage shall state the following:

Warning

Arc Flash and Shock Hazard

Appropriate PPE Required

3.02 FIELD QUALITY CONTROL

A. Inspect completed installation for physical damage, proper alignment, anchorage, and grounding.

B. Measure insulation resistance of each bus section phase to phase and phase to ground for one minute each. Test voltage shall be 1000 volts, and minimum acceptable value for insulation resistance is 2 megohms.

C. Check tightness of accessible bolted bus joints using a calibrated torque wrench. Tightness shall be in accordance with manufacturer's recommended values.

3.03 ADJUSTING AND CLEANING

A. Adjust all operating mechanisms for free mechanical movement.

B. Touch up scratched or marred surfaces to match original finish.

END OF SECTION

SECTION 16440

DISCONNECT SWITCHES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Disconnect switches.

B. Fuses.

C. Enclosures.

1.02 REFERENCES

A. ANSI/UL 198C - High-Intensity Capacity Fuses; Current Limiting Types.

B. ANSI/UL 198E - Class R Fuses.

C. NEMA KS 1 - Enclosed Switches.

1.03 SUBMITTALS

A. Submit product data under provisions of Division 1.

B. Include outline drawings with dimensions, and equipment ratings for voltage, capacity, horsepower, and short circuit current interrupting rating.

1.04 EXTRA STOCK

A. Provide extra stock under provisions of Division 1.

B. Fuses: Provide one set of 3 fuses of each size and type of fuse installed.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - DISCONNECT SWITCHES

A. Square D.

B. Substitutions: Under provisions of Division 1.

2.02 DISCONNECT SWITCHES

A. Fusible Switch Assemblies: NEMA KS 1; Heavy Duty type; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse Clips: Designed to accommodate Class R fuses and reject all other classes of fuse.

B. Nonfusible Switch Assemblies: NEMA KS 1; Heavy Duty type; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.

C. Enclosures: NEMA KS 1; Type 1, 3R or 4 as indicated on Drawings.

2.03 ACCEPTABLE MANUFACTURERS - FUSES

A. Cooper-Bussmann.

B. Ferraz-Shawmut.

C. Economy.

D. Substitutions: Under provisions of Division 1.

2.04 FUSES

A. Fuses 600 Amperes and Less: ANSI/UL 198E, Class RK1; RK5; dual element, current limiting, time delay, one-time fuse, 600 volt.

B. Interrupting Rating: 200,000 rms amperes.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install disconnect switches where indicated on Drawings.

B. Install fuses in fusible disconnect switches.

C. All disconnect switches shall have signage for arc hazard installed. The marking shall be located to be clearly visible to qualified personnel before examination,

D. All enclosed switches shall have signage for arc hazard installed. The marking shall be located to be clearly visible to qualified personnel before examination, adjustment, servicing or maintenance of the equipment. At a minimum the signage shall state the following:

Warning

Arc Flash and Shock Hazard

Appropriate PPE Required

END OF SECTION

SECTION 16450

SECONDARY GROUNDING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Power system grounding.

B. Communication system grounding.

C. Electrical equipment and raceway grounding and bonding.

1.02 SYSTEM DESCRIPTION

A. Ground the electrical service system neutral at service entrance in accordance with the NEC and as shown on the drawings.

B. Ground each separately-derived system neutral to nearest effectively grounded building structural steel member.

C. Provide telecommunications bonding backbone at point of service entrance and connect to nearest effectively grounded metallic water pipe.

D. Bond together system neutrals, service equipment enclosures, exposed non-current carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, receptacle ground connectors, and plumbing systems.

1.03 SUBMITTALS

A. Submit shop drawings under provisions of Division 1.

B. Indicate location of system grounding electrode connections, and routing of grounding electrode conductor.

PART 2 PRODUCTS

2.01 MATERIALS

A. Solid Ground Rods: Copper-encased steel, ¾ inch diameter, minimum length 10 feet.

B. Electrolytic Ground Rods: UL listed, self-activating, sealed, maintenance free, self-contained ground rod using electrolytically enhanced grounding. The ground rod shall consist of a nominal two inch diameter hollow copper tube with a wall thickness of not less than 0.83 inches permanently capped on the top and bottom. Air breather holes shall be provided in the top of the vertical portion of the tube and drainage holes shall be provided along the bottom length of the tube for electrolyte drainage into the surrounding soil. The ground rod shall be factory filled with non-hazardous Calsolyte to enhance grounding performance. The ground rod shall be a minimum of ten feet long with a vertical riser of three feet in length. A stranded #4/0 AWG copper conductor shall be Cadwelded to the side of the vertical portion of the rod for grounding electrode conductor connection.

PART 3 EXECUTION

3.01 INSTALLATION

A. Provide a separate, insulated equipment grounding conductor in feeder and branch circuits and in all LFMC. Terminate each end on a grounding lug, bus, or bushing.

B. Connect grounding electrode conductors to metal water pipe using a suitable ground clamp. Make connections to flanged piping at street side of flange. Provide bonding jumper around water meter and back flow preventors.

C. Supplementary Grounding Electrode: Use effectively grounded metal frame of the building.

D. Telecommunications Bonding Backbone: Leave 10 feet slack conductor at terminal board. Terminate at the electrical service entrance and at the ground bar or grounding lug on telecommunications backboard.

E. Provide grounding and bonding at Utility Company's metering equipment.

3.02 FIELD QUALITY CONTROL

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

B. Upon completion of the ground installation and before connection to the permanent facility power the Contractor shall measure the ground resistance of the grounding electrode system. The testing shall utilize an earth resistance meter and be conducted in accordance with the IEEE Standard for 3-point fall of potential method. The Contractor shall notify the Owner’s representatives prior to the scheduled ground testing date so they may be present at the time of testing. The Contractor shall immediately notify the Owner’s representative if the measured ground resistance is above 10 ohms. The Contractor shall submit a copy of the test report to the Owner’s representative within 10 days after testing and before the ground system becomes inaccessible.

END OF SECTION

SECTION 16461

DRY TYPE TRANSFORMERS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Dry type two winding transformers.

1.02 REFERENCES

A. ANSI/NEMA - ST 1 - Specialty Transformers.

B. ANSI/NEMA ST 20 - Dry Type Transformers for General Applications.

1.03 SUBMITTALS

A. Submit product data under provisions of Division 1.

B. Include outline and support point dimensions of enclosures and accessories, unit weight, voltage, KVA, and impedance ratings and characteristics, loss data, efficiency at 25, 50, 75 and 100 percent rated load, sound level, tap configurations, insulation system type, and rated temperature rise.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store and protect products under provisions of Division 1.

B. Store in a warm, dry location with uniform temperature. Cover ventilating openings to keep out dust.

C. Handle transformers using only lifting eyes and brackets provided for that purpose. Protect units against entrance of rain, sleet, or snow if handled in inclement weather.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - DRY TYPE TWO WINDING TRANSFORMERS

A. Square D.

B. General Electric.

C. Acme.

D. Substitutions: Under provisions of Division 1.

2.02 DRY TYPE TWO WINDING TRANSFORMERS

A. Dry Type Transformers: ANSI/NEMA ST 20; factory-assembled, air cooled dry type transformers; ratings as shown on the Drawings. Transformers shall be designed for use on non-linear loads with a double size neutral terminal and be UL K-4 rated.

B. Insulation system and average winding temperature rise for rated KVA as follows:

Rating	Class	Rise (º C)
1-15	185	115
16-500	220	115

C. Case temperature shall not exceed 35ºC rise above ambient at its warmest point.

D. Winding Taps, Transformers 15 KVA and Larger: ANSI/NEMA ST 20.

E. Sound Levels: per ANSI/NEMA ST 20 as follows:

KVA Rating	Sound Level
1-9	40 dB
10-50	45 dB
51-150	50 dB
151-300	55 dB
301-500	60 dB
501-700	62 dB

F. Sound Levels: Maximum sound levels are as follows:

KVA Rating	Sound Level
1-5	30 dB
6-25	40 dB
26-150	42 dB
151-225	43 dB
226-300	47 dB
301-500	51 dB

G. Basic Impulse Level: 10 KV.

H. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.

I. Mounting: Transformers 75 KVA and less shall be suitable for wall, floor, or trapeze mounting; transformers larger than 75 KVA shall be suitable for floor or trapeze mounting.

J. Coil Conductors: Continuous copper windings with terminations brazed or welded.

K. Enclosure: ANSI/NEMA ST 20; Type 1. Provide lifting eyes or brackets.

L. Isolate core and coil from enclosure using vibration- absorbing mounts.

M. Nameplate: Include transformer connection data and overload capacity based on rated allowable temperature rise.

PART 3 EXECUTION

3.01 INSTALLATION

A. Set transformer plumb and level.

B. Use liquiditght flexible conduit, 2 ft. minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure per manufacturer's recommended maximum penetration height.

C. Mount transformers on vibration isolating pads suitable for isolating the transformer noise from the building structure.

D. Provide seismic restraints.

E. All dry type transformers shall have signage for arc hazard installed. The marking shall be located to be clearly visible to qualified personnel before examination, adjustment, servicing or maintenance of the equipment. At a minimum the signage shall state the following:

Warning

Arc Flash and Shock Hazard

Appropriate PPE Required

3.02 FIELD QUALITY CONTROL

A. Check for damage and tight connections prior to energizing transformer.

B. Measure primary and secondary voltages under normal and standby building operation and make appropriate tap adjustments.

END OF SECTION

SECTION 16470

PANELBOARDS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Service and distribution panelboards.

B. Lighting and appliance branch circuit panelboards.

1.02 REFERENCES

A. NEMA AB 1 - Molded Case Circuit Breakers.

B. NEMA PB 1 - Panelboards.

C. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

D. NEMA PB 1.2 - Application Guide for Ground-fault Protective Devices for Equipment.

1.03 SUBMITTALS

A. Submit shop drawings for equipment and component devices under provisions of Division 1.

B. Include outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker arrangement and sizes.

1.04 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Division 1.

1.05 SPARE PARTS

A. Keys: Furnish 2 each to Owner.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - PANELBOARDS [AND LOAD CENTERS]

A. Square D.

B. Substitutions: Under provisions of Division 1.

2.02 MAIN AND DISTRIBUTION PANELBOARDS

A. Panelboards: NEMA PB 1; circuit breaker type.

B. Enclosure: NEMA PB 1; Type 1 or 3R. As indicated on the drawings. Cabinet size: 6 inches deep; 24 inches wide minimum.

C. Provide cabinet front with concealed trim clamps, and hinged door with flush lock. Finish in manufacturer's standard gray enamel.

D. Provide panelboards with copper bus, ratings as scheduled on Drawings. Provide copper ground bus in all panelboards.

E. Minimum Integrated Short Circuit Rating: 10,000 amperes RMS symmetrical for 240 volt panelboards; 18,000 amperes RMS symmetrical for 480 volt panelboards, or as shown on Drawings.

F. Molded Case Circuit Breakers: NEMA AB 1; provide circuit breakers with integral thermal and instantaneous magnetic trip in each pole. Do not use tandem circuit breakers. Breaker ampacity and AIC rating shall be visible on breaker without removing panel deadfront or cover.

2.03 BRANCH CIRCUIT PANELBOARDS

A. Lighting and Appliance Branch Circuit Panelboards: NEMA PB1; circuit breaker type.

B. Enclosure: NEMA PB 1; Type 1 or 3R. As indicated on Drawings.

C. Cabinet Size: 6 inches deep; 20 inches wide minimum.

D. Provide flush or surface cabinet front as indicated on the Drawings with concealed trim clamps, concealed hinge and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.

E. Provide panelboards with copper bus, ratings as scheduled on Drawings. Provide copper ground bus in all panelboards.

F. Minimum Integrated Short Circuit Rating: 10,000 amperes RMS symmetrical for 240 volt panelboards; 18,000 amperes RMS symmetrical for 480 volt panelboards. Provide higher ratings as shown on Drawings.

G. Molded Case Circuit Breakers: NEMA AB 1; bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles. Provide circuit breakers UL listed as Type SWD for lighting circuits. Provide UL Class A ground fault interrupter circuit breakers where scheduled on Drawings.

H. Provide circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.

2.04 PANELBOARD IDENTIFICATION

A. For each panelboard, provide typed schedule denoting each circuit load by the load type and final name and room number. Schedule shall not be typed with names shown on the Contract Drawings unless names are acceptable to the Owner.

B. All panelboards shall have engraved nameplates per section 16195.

C. Where more than one nominal voltage system is present on the premises, the conductor color-coding legend shall be permanently posted at each branch circuit and distribution panelboard per NEC requirements.

D. All panelboards shall have signage for arc hazard installed. The marking shall be located to be clearly visible to qualified personnel before examination, adjustment, servicing or maintenance of the equipment. At a minimum the signage shall state the following:

Warning

Arc Flash and Shock Hazard

Appropriate PPE Required

PART 3 EXECUTION

3.01 INSTALLATION

A. Install panelboards plumb and flush with wall finishes, in conformance with NEMA PB 1.1.

B. Height: 6 feet, 6 inches to top of panelboard.

C. Provide filler plates for unused spaces in panelboards.

D. Provide spare breakers or prepared space as indicated on the schedules.

E. Panel Schedules: Revise schedules to reflect circuiting changes required to balance phase loads.

3.02 FIELD QUALITY CONTROL

A. Measure steady state load currents at each panelboard feeder. Should the difference at any panelboard between phases exceed 20 percent, rearrange circuits in the panelboard to balance the phase loads within 20 percent upon approval of engineer. Take care to maintain proper phasing for multi-wire branch circuits.

B. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers.

END OF SECTION

SECTION 16480

MOTOR CONTROL

PART 1 GENERAL

1.01 WORK INCLUDED

A. Manual motor starters.

B. Magnetic motor starters.

C. Combination magnetic motor starters.

D. Motor control centers.

E. Motor starter panelboards.

1.02 RELATED WORK

A. Section 16190 - Supporting Devices: Housekeeping pads.

1.03 REFERENCES

A. ANSI/NEMA ICS 6 - Enclosures for Industrial Controls and Systems.

B. ANSI/UL 198C - High-Intensity Capacity Fuses; Current- Limiting Types.

C. ANSI/UL 198E - Class R Fuses.

D. NEMA AB 1 - Molded Case Circuit Breakers.

E. NEMA ICS 2 - Industrial Control Devices, Controllers, and Assemblies.

F. NEMA KS 1 - Enclosed Switches.

G. NEMA PB 1 - Panelboards.

H. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

1.04 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 1.

B. Indicate on shop drawings, front and side views of motor control center enclosures with overall dimensions. Include conduit entrance locations and requirements; nameplate legends; size and number of bus bars per phase, [neutral,] and ground; electrical characteristics including voltage, frame size and trip ratings, withstand ratings, and time-current curves of all equipment and components.

C. Provide product data on motor starters and combination motor starters, relays, pilot devices, and switching and overcurrent protective devices.

D. Submit manufacturers' instructions under provisions of Division 1.

1.05 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Division 1.

B. Include spare parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 1.

B. Deliver in 60-inch maximum width shipping splits, individually wrapped for protection, and mounted on shipping skids.

C. Store and protect products under provisions of Division 1.

D. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

E. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to motor control center components, enclosure, and finish.

1.07 SPARE PARTS

A. Keys: Furnish 2 each to Owner.

B. Fuses: Furnish to Owner 1 spare fuses of each type and rating installed.

C. Fuse Pullers: Furnish one fuse puller to Owner.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - MOTOR STARTERS

A. Allen Bradley.

B. Substitutions: Under provisions of Division 1 with approval of Owner’s representative.

2.02 MANUAL MOTOR STARTERS

A. Manual Motor Starter: NEMA ICS 2; size and number of poles as required by the load served, AC general-purpose Class A manually operated non-reversing full-voltage controller for induction motors rated in horsepower, with overload relay, low voltage protection, red LED pilot light, NO auxiliary contact, and push button operator.

B. Fractional Horsepower Manual Starter: NEMA ICS 2; AC general-purpose Class A manually operated, number of poles as required by the load served, full-voltage controller for fractional horsepower induction motors, with thermal overload unit, red pilot light, and toggle operator.

C. Motor Starting Switch: NEMA ICS 2; AC general-purpose Class A manually operated 1 pole, full-voltage controller for fractional horsepower induction motors, without thermal overload unit, red pilot light, and toggle operator.

D. Enclosure: ANSI/NEMA ICS 6; Type 1, 3R or 4. As indicated on the Drawings.

2.03 MAGNETIC MOTOR STARTERS

A. Magnetic Motor Starters: NEMA ICS 2; AC general-purpose Class A magnetic controller for induction motors rated in horsepower.

B. Full Voltage Starting: Non-reversing type.

C. Coil Operating Voltage: 24 volts AC, 60 Hertz or as otherwise specified on the drawings.

D. Size: NEMA ICS 2; size as required by the load served.

E. Overload Relay: Allen-Bradley E1 plus overload with Ethernet port for all starters to be controlled by the main PLC panel.

F. Enclosure: NEMA ICS 6; Type 1 or 3R as shown on the drawings.

G. Combination Motor Starters: Combine motor starters with instantaneous trip molded case circuit breaker disconnect in common enclosure.

H. Auxiliary Contacts: NEMA ICS 2; two field convertible contacts in addition to seal-in contact.

I. Pushbuttons: NEMA ICS 2; START/STOP in front cover.

J. Indicating Lights: NEMA ICS 2; RUN: green LED light in front cover.

K. Selector Switches: NEMA ICS 2; HAND/OFF/AUTO, in front cover.

L. Control Power Transformers: 24 volt AC, grounded, VA capacity as required by the load served in each motor starter.

2.04 CONTROLLER OVERCURRENT PROTECTION AND DISCONNECTING MEANS

A. Molded Case Thermal-Magnetic Circuit Breakers: NEMA AB 1; circuit breakers with integral thermal and instantaneous magnetic trip in each pole.

B. Motor Circuit Protector: NEMA AB 1; circuit breakers with integral instantaneous magnetic trip in each pole.

C. Nonfusible Switch Assemblies: NEMA KS 1; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle. Provide interlock to prevent opening front cover with switch in ON position. Handle lockable in OFF position.

D. Fusible Switch Assemblies: NEMA KS 1; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle.² Provide interlock to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse Clips: Designed to accommodate Class R fuses.

2.05 ACCEPTABLE MANUFACTURERS - FUSES

A. Buss.

B. Gould-Shawmut.

C. Economy.

D. Substitutions: Under provisions of Division 1.

2.06 FUSES

A. Fuses: ANSI/UL 198E, Class RK1, current limiting, one-time fuse, 600 volt.

B. Interrupting Rating: 200,000 rms amperes.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install motor control equipment in accordance with manufacturer's instructions.

B. Install fuses in fusible switches.

C. Select and install heater elements in motor starters to match installed motor characteristics.

D. Motor Data: Provide neatly typed label inside each motor starter enclosure door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating.

E. After final connections are made, check and correct the rotation of all motors.

F. Field adjust the trip settings of all motor starter magnetic trip only circuit breakers to approximately 11 times motor full load current. Determine full load current from motor nameplate following installation.

G. Motor starting equipment shall be listed for use with the motors specified under Division 15.

END OF SECTION

SECTION 16496

ENCLOSED TRANSFER SWITCH

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Complete factory assembled automatic transfer switch.

1.02 RELATED SECTIONS

A. Section 16195 - Electrical Identification: Engraved nameplates.

B. Section 16622 – Package Engine Generator System.

1.03 REFERENCES

A. NFPA 70 - National Electrical Code.

B. NEMA ICS 1 - General Standards for Industrial Control and Systems.

C. NEMA ICS 2 - Standards for Industrial Control Devices, Controllers, and Assemblies.

D. NEMA ICS 6 - Enclosures for Industrial Controls and Systems.

E. IEEE 446 – Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications.

F. NFPA 110 – Emergency and Standby Power Systems.

1.04 SUBMITTALS

A. Submit under provisions of Division 1.

B. Product Data: Provide catalog sheets showing voltage, switch size, ratings and size of switching devices, operating logic, short circuit ratings, dimensions, and enclosure details.

1.05 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Division 1.

B. Operation Data: Include instructions for operating equipment. Include instructions for operating equipment under emergency conditions when engine generator is running.

C. Maintenance Data: Include routine preventative maintenance and lubrication schedule. List special tools, maintenance materials, and replacement parts.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience. Manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation and service in accordance with ISO 9001.

B. Supplier: Authorized distributor of specified manufacturer with minimum three years documented experience.

1.07 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Conform to requirements of NFPA 110 for a Level 2 system.

C. Furnish products listed and classified by UL as suitable for purpose specified and indicated.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Division 1.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to internal components, enclosure and finish.

1.09 FIELD MEASUREMENTS

A. Verify that field measurements are as instructed by manufacturer.

1.10 MAINTENANCE SERVICE

A. Furnish service and maintenance of transfer switch for one year from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. ASCO.

B. Caterpillar.

C. Substitutions: Under provisions of Division 1.

2.02 AUTOMATIC TRANSFER SWITCH

A. Description: NEMA ICS 2, UL 1008 listed, service entrance rated automatic transfer switch.

B. Configuration: Double throw, electrically operated, electrically and mechanically interlocked and mechanically held transfer switch. The transfer switch shall be specifically designed so that it cannot stop in a neutral position.

2.03 SERVICE CONDITIONS

A. Service Conditions: NEMA ICS 1.

B. Operating Temperature: minus 40ºF to plus 140°F.

C. Altitude: 300 feet.

2.04 RATINGS

A. Voltage: 480 volts, three phase, four wire.

B. Frequency: 60 Hz.

C. Switched Poles: 3 plus a neutral bus with lugs.

D. Load Inrush Rating: Combination load.

E. Continuous Rating: As noted on the Drawings.

F. Interrupting Capacity: 250 percent of continuous rating.

G. Withstand Current Rating: The switch shall be rated to withstand 22,000 Amps rms symmetrical short circuit current for 3 cycles.

2.05 PRODUCT OPTIONS AND FEATURES

A. ATS Controls: Microprocessor controls with digital display for status information.

B. Provide the transfer switch with a permanently attached manual operating handle and quick-break, quick-make over-center contact mechanisms.

C. Main switch contacts shall be high-pressure silver alloy. Contact assemblies shall have arc chutes for positive arc extinguishing. Arc chutes shall have insulating covers to prevent inter-phase flashover.

D. Transfer switch internal wiring shall be composed of pre-manufactured harnesses that are permanently marked for source and destination. Harnesses shall be connected to the control system by means of locking disconnect plug(s) to allow the control system to be disconnected and service without disconnecting power from the transfer switch mechanism.

E. Field control connections shall be made on a common terminal block that is clearly and permanently labeled.

F. Transfer switch shall be provided with AL/CU rated copper mechanical lugs sized to accept the full output rating of the switch or the number and size of conductors shown on the drawings, whichever is larger.

G. Operator Panel: Provide with a control panel to allow the operator to view the status and control the operation of the transfer switch. The operator panel shall be a sealed membrane panel rated NEMA 3R that is permanently labeled for switch and control functions. The operator panel shall be provided with the following features and capabilities:
   1. High intensity LED lamps to indicate the source that the load is connected to and which sources are available. Source available LED indicators shall operate from the control microprocessor to indicate the true condition of the sources as sensed by the control.
   2. High intensity LED lamps to indicate that the transfer switch in “Not in Auto” and “Test/Exercise Active” to indicate that the control system is testing or exercising the generator set.
   3. “OVERIDE” pushbutton to cause the transfer switch to bypass any active time delays for start, transfer, and retransfer and immediately proceed with its next logical operation.
   4. “TEST” pushbutton to initiate a preprogrammed test sequence for the generator set and transfer switch. The transfer switch shall be programmable for test with load or test without load.
   5. “REST/LAMP TEST” pushbutton that will clear any faults present in the control or simultaneously test all lamps on the panel by lighting them.
   6. The control system shall continuously log information on the number of hours each source has been connected to the load, the number of times transferred, and the total number of times each source has failed. This information shall be available via a PC-based service tool or on the operator display panel.
   7. Security key switch to allow the user to inhibit adjustments, manual operation or testing of the transfer switch unless the key is in place and operated.
   8. Analog AC meter display panel to display 3-phase AC Amps, 3-phase AC Volts, Hz, kW load level, and load power factor. The display shall be color-coded with green scale indicating normal or acceptable operating level, yellow indicating conditions nearing a fault and red indicating operation in excess of rated conditions for the transfer switch.

H. The transfer switch control system shall be configurable in the field for any operating voltage level up to 600 VAC. Provide RMS voltage sensing and metering that is accurate to within plus or minimum 1% of nominal voltage level. Frequency sensing shall be accurate to within plus or minus 0.2%. Voltage sensing shall be monitored based on the normal voltage at the site.

I. Transfer switch voltage sensors shall be close differential type providing source availability information to the control system based on the following functions:
   1. Monitoring all phases of the normal source for under voltage conditions (adjustable for pickup in a range of 85 to 98% of the normal voltage level and dropout in a range of 75 to 98% of normal voltage level).
   2. Monitoring all phases of the standby source for under voltage conditions (adjustable for pickup in a range of 85 to 98% of the normal voltage level and dropout in a range of 75 to 98% of pickup voltage level).
   3. Monitoring all phases of the normal and standby sources for voltage imbalance.
   4. Monitoring all phases of the normal and standby sources for loss of a single phase.
   5. Monitoring all phases of the normal and standby sources for phase rotation.
   6. Monitoring all phases of the normal and standby sources for over voltage conditions (adjustable for dropout over a range of 105 to 135% or normal voltage and pickup at 95 – 99% of dropout voltage level).
   7. Monitoring of all phases of the normal and standby sources for over or under frequency conditions.
   8. Monitoring the neutral current flow in the load side of the transfer switch. The control shall initiate an alarm when the neutral current exceeds a preset adjustable value in the range of 100 – 150% (set at 125%) of rated phase current for more than an adjustable time period of 10 to 60 seconds (set at 45 seconds).

J. All transfer switch sensing shall be configurable from a Windows XP PC-based service tool to allow setting of levels, and enabling or disabling of features and functions. Selected functions including voltage sensing levels and time delays shall be configurable using the operator panel. The transfer control shall incorporate a series of diagnostic LED lamps.

K. The transfer switch shall incorporate adjustable time delays for generator set start (adjustable in a range from 0 – 15 seconds, set at 5 seconds); transfer (adjustable in a range from 0 – 120 seconds, set at 2 seconds); retransfer (adjustable in a range from 0 – 30 minutes, set at 30 minutes); and generator stop (cool down)(adjustable in a range of 0 – 30 minutes, set at 10 minutes).

L. The control shall have optically isolated logic inputs, high isolation transformers for AC inputs, and relays on all outputs to provide optimum protection form line voltage surges, RFI and EMI.

M. The transfer switch shall provide an isolated relay contact for starting of the generator set. The relay shall be normally held open, and close to start the generator set. Output contacts shall be form C.

N. Provide one set of Form C auxiliary contacts on both sides operated by transfer switch position, rated 10 Amps, 250 VAC.

O. Generator set exercise (test) with load mode: The control system shall be configurable to test the generator set under load. In this mode the transfer switch shall control the generator set in the following sequence:
   1. Transfer switch shall initiate the exercise sequence at a time indicated in the exercise timer program or when manually initiated by the operator.
   2. When the control system senses the generator set at rated voltage and frequency it shall operate to connect the load to the generator set.
   3. The generator set shall operate connected to the load for the duration of the exercise period. If the generator set fails during this period the transfer switch shall automatically reconnect the load to the normal source.
   4. At the completion of the exercise period the transfer switch shall operate to connect the load to the normal source.

5. The transfer switch shall operate the generator set unloaded for the programmed cool down period and then remove the start signal from the generator set. If the normal source fails at any time when the generator set is running the transfer switch shall immediately connect the load to the generator set.

P. Generator set exercise (test) without load mode: The control system shall be configurable to test the generator set without transfer switch load connected. In this mode the transfer switch shall control the generator set in the following sequence:
   1. Transfer switch shall initiate the exercise sequence at a time indicated in the exercise timer program or when manually initiated by the operator.
   2. When the control system senses the generator set at rated voltage and frequency it shall operate the generator set unloaded for the duration of the exercise period.
   3. At the completion of the exercise period the transfer switch shall remove the start signal from the generator set and shut the generator down. If the normal source fails at any time when the generator set is running the transfer switch shall immediately connect the load to the generator set.

2.06 ENCLOSURE

A. Enclosure shall be UL listed NEMA 4X stainless steel. The enclosure shall provide wire bend space in compliance to the latest version of NFPA 70. The cabinet door shall include permanently mounted key type latches.

B. Manual operating handles and all control switches (other than key operated switches) shall be accessible to authorized personnel only by opening the key locking cabinet door.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify conditions under the provisions of Division 1.

B. Verify that surface is suitable for transfer switch installation.

3.02 INSTALLATION

A. Install transfer switches in accordance with manufacturer's instructions.

B. Provide engraved plastic nameplates under the provisions of Section 16195.

C. All transfer switches shall have signage for arc hazard installed. The marking shall be located to be clearly visible to qualified personnel before examination, adjustment, servicing or maintenance of the equipment. At a minimum the signage shall state the following:

Warning

Arc Flash and Shock Hazard

Appropriate PPE Required

3.03 MANUFACTURER'S SERVICES

A. The transfer switch manufacturer shall perform a complete operational test on the transfer switch prior to shipping from the factory. A certified test report shall be included in the packing list with the transfer switch. The test process shall include calibration of voltage sensors.

3.04 DEMONSTRATION

A. Provide systems demonstration under provisions of Division 1.

B. Demonstrate operation of transfer switch in normal, and standby modes.

END OF SECTION

SECTION 16510

LIGHTING FIXTURES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Interior luminaires and accessories.

B. Exterior luminaires and accessories.

C. Lamps.

D. Ballasts.

E. Fluorescent Luminaire Disconnect.

1.02 RELATED WORK

A. Division 9 - Painting.

B. Division 9 - Ceilings.

C. Section 16190 – Supporting Devices.

D. Section 16450 – Secondary Grounding.

E. Section 16535 - Emergency Lighting Equipment.

1.03 REFERENCES

A. ANSI C82.1 - Specification for Fluorescent Lamp Ballasts.

B. ANSI ANSLG C78.377 - Specifications for the Chromaticity of Solid State Lighting Products.

C. USGBC LEED NC 2.2 – Leadership in Energy and Environmental Design.

D. UL 935 – Specification for Fluorescent-Lamp Ballasts.

1.04 SUBMITTALS

A. Submit product data under provisions of Division 1.

B. Product Data: Submit the following:
   1. Luminaires: Include manufacturer’s product data sheets and/or shop drawings including outline drawings showing support points, weights, and accessory information for each luminaire type.
   2. Lamps: Submit manufacturer’s product data sheets for each lamp used on the project. Indicate luminaire type where each lamp is used.
   3. Ballasts: Submit manufacturer’s product data sheets for each different type of ballasts used on the project. Indicate which luminaires each ballast is used in.
   4. Solid state drivers: Submit manufacturer’s product data sheets for each type used on the project.

C. CLOSEOUT SUBMITTALS

D. Project Record Drawings: Indicate actual locations and mounting heights of all lighting fixtures and accessories on the project record drawings.

E. Operation and Maintenance Manuals:

1. Provide recommended luminaire cleaning and re-lamping schedule. If any luminaire lenses require special lubricants for cleaning, include this in the schedule.
2. Provide detailed bill of materials for all items purchased in this section including distributor's contact name, phone number and pertinent information.
3. Provide luminaire manufacturer's installation instructions.
4. Include any specific warranty information provided by the manufacturer for luminaires, drivers, lamps and ballasts.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site, store and protect under provisions of Division 1.

1.06 EXTRA STOCK

A. Provide extra stock under provisions of Division 1.

B. Provide one spare of each type of fixture used.

C. Provide one carton (30 lamps) of T5HO lamps and 10 of each size of compact fluorescent lamps installed.

D. Lenses: Three percent of quantity furnished, minimum of one of each size and type.

E. Ballasts: One of each size and type installed.

F. Drivers: One of each type installed.

PART 2 PRODUCTS

2.01 INTERIOR LUMINAIRES AND ACCESSORIES

A. Luminaires: Provide UL listed luminaires as scheduled on the drawings or as approved equal.

B. Listing: Luminaires shall be listed for use in the environment in which they are installed. For example, luminaires installed in direct contact with insulation, or in hazardous, wet, damp, or corrosive locations shall be UL listed for such application.

C. Accessories: Provide all mounting kits, supports, interconnecting wiring, power supplies, trim kits, gaskets, etc. for a complete installation.

2.02 EXTERIOR LUMINAIRES AND ACCESSORIES

A. Luminaires: Provide UL listed luminaires as scheduled on the drawings or as approved equal.

B. Listing: Luminaires shall be listed for use in the environment in which they are installed. For example, luminaires installed in hazardous, wet, damp, or corrosive locations shall be UL listed for such application.

C. Enclosures: Complete with gaskets to form weatherproof assembly.

D. Accessories: Provide all mounting kits, supports, interconnecting wiring, power supplies, trim kits, gaskets, etc. for a complete installation

E. Provide low temperature solid state LED drivers, with reliable starting to -32 º F.

2.03 ACCEPTABLE MANUFACTURERS - LAMPS

A. Phillips Lighting Company.

B. Osram Sylvania.

C. General Electric.

D. Substitutions: Under provisions of Division 1.

2.04 LAMPS - FLUORESCENT

A. All fluorescent lamp wattages and types shall be as scheduled on the Plans with a configuration and pin base as required for installation in the specified light fixtures.

B. All fluorescent lamps shall be low-mercury type that passes the Toxicity Characteristic Leaching Procedure (TCLP) test at end of life.

C. T5 Fluorescent Lamps (T5, T5HO): 5000° K, tri-phosphor, linear fluorescent lamps with a minimum CRI of 85, and rated life of 20,000 hours (based on 3 hours per start). Acceptable Manufacturer/Model: GE “Starcoat Ecolux”, Philips “Silhouette”, Sylvania “Pentron”, or approved equal.

2.05 LAMPS – LED

A. Light Emitting Diode (LED): 4100° K, with minimum 75CRI and a minimum rated life of 50,000 hours at 75 degrees F average indoor ambient temperature, 40 degrees F for outdoors.

2.06 ACCEPTABLE MANUFACTURERS - BALLASTS

A. Advance.

B. Osram Sylvania.

C. Universal.

D. Substitutions: Under provisions of Division 1.

2.07 BALLASTS - FLUORESCENT

A. All fluorescent ballasts shall have the following minimum criteria:
   1. Ballasts shall operate with no visible flicker (<3% flicker index) from 60 Hz input source of 120 through 277 Volts, and sustain variations of ± 10% (Voltage & Frequency) with no damage to the ballasts.
   2. Ballast shall have Class “A” sound rating, a Power Factor greater than 98% when used with primary lamp, and a Lamp Current Crest Factor (ratio of peak to RMS current) of 1.7 or less in accordance with lamp manufacturer recommendation and ANSI C82.11-1993.
   3. Input current Total Harmonic Distortion shall not exceed 10% for the primary lamp.
   4. Ballasts shall comply with FCC Part 18 Non-Consumer Equipment for EMI (power line conducted) and RFI (Radiated), shall provide transient immunity as recommended by ANSI C62.41-1991, Location A2, and shall tolerate sustained open circuit and short circuit output conditions without damage.
   5. Ballasts shall be Underwriters Laboratory (UL 935) listed, Class P, and CSA or NSF certified where applicable.
   6. Ballasts shall have a five year warranty.

B. T5/T5HO Electronic Ballasts: Provide multi-volt (120-277V), programmed start, high power factor ballast (above 95%), operating lamps at a frequency of 42 kHz or higher with a ballast factor between 0.81 and 1.0. Ballast shall contain a lamp End-Of-Life (EOL) detection and shut down circuit in accordance with ANSI/IEC proposed standards Ballast shall have a minimum start temperature of 0°F, a maximum ionization current (glow current) of 10mA during the preheating interval and shall have a minimum Rh/Rc ratio (resistance measured hot vs. room temperature) >4.00 to ensure proper lamp starting. Manufacturer/Model: Advance “Optanium”, Universal “Accustart”, or Osram/Sylvania “Quicktronic Professional” or approved equal.

2.08 POWER SUPPLY – LED

A. Provide UL listed power supply as recommended by the LED fixture manufacturer for operation of the specified LED lamps. Power supply shall be integral to the luminaire unless otherwise noted on the Plans. Power supply shall operate at the supply voltage indicated on the Plans and shall be listed for starting and operating the lamps at -32F where installed outdoors.

2.09 LUMINAIRE DISCONNECT

A. UL listed, 4A, 600V, luminaire disconnect with tin-plated brass contacts, finger-safe polycarbonate female housing, 105º C temperature rating, and two or three-pole configuration to match load served. Ideal “PowerPlug” series or approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install lamps in luminaires and lampholders.

B. Unless otherwise noted on Plans, provide ballast integral to luminaires, pre-wired and installed at the factory, suitable for use with the selected lamp.

C. Support surface-mounted luminaires directly from building structure.

D. Install recessed luminaires to permit removal from below. Use plaster frames in hard ceilings.

E. Support luminaries in suspended ceilings from structure above using a minimum of (4) anchors in accordance with Section 16190.

F. Rigidly align continuous rows of lighting fixtures for true in-line appearance.

G. Provide luminaire disconnecting means in ballast channel of each fluorescent fixture to meet 2011 NEC 410.130(G) requirements. Provide for all other lighting fixtures where 3rd party listing will not be violated.

H. Mechanical Rooms: Lighting fixture locations shown on Plans in mechanical and electrical equipment rooms are approximate. Coordinate mounting height and location of lighting fixtures to clear mechanical, electrical and plumbing equipment and to adequately illuminate meters, gauges and equipment. Support all lighting fixtures independently of duct work or piping.

3.02 RELAMPING

A. Relamp luminaires which have failed lamps at completion of Work.

B. Replace LED luminaires which have failed drivers or modules at completion of Work.

3.03 ADJUSTING AND CLEANING

A. Align luminaires and clean lenses and diffusers at completion of Work. Clean paint splatters, dirt, and debris from installed luminaires.

B. Touch up luminaire finish at completion of work.

END OF SECTION

SECTION 16535

EMERGENCY LIGHTING EQUIPMENT

PART 1 GENERAL

1.01 WORK INCLUDED

A. Emergency lighting units.

B. Emergency exit signs.

C. Emergency fluorescent lamp power supplies.

1.02 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 1 General Requirements, and Section 16010 – Basic Electrical Requirements.

B. Section 16111 – Conduit.

C. Section 16120 – Wire and Cables.

D. Section 16130 – Boxes.

E. Section 16195 – Electrical Identification.

F. Section 16510 – Lighting Fixtures.

1.03 REFERENCE STANDARDS

A. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures.

B. NECA/IESNA 500 – Recommended Practice for Installation Indoor Commercial Lighting System.

C. UL 924 - Emergency Lighting and Power Equipment.

1.04 REGULATORY REQUIREMENTS

A. Conform to State and local building code and NFPA 101 for installation requirements.

B. Furnish emergency lighting units and exit signs that are UL 924 listed and labeled for their indicated use and location on this project.

1.05 WARRANTY

A. Emergency Lighting Units: Submit a warranty, mutually executed by the manufacturer and the installer, agreeing to replace emergency lighting units that fail in materials or workmanship within five years, beginning on the date of manufacturer.

B. LED Exit Signs: Submit a warranty, mutually executed by the manufacturer and the installed, agreeing to replace LED exit signs that fail in materials or workmanship within five years, beginning on the date of substantial completion.

1.06 SUBMITTALS

A. Product Data: Submit product data under describing emergency lighting including data substantiating that materials comply with specified requirements. Arrange data for luminaires in the order of fixture designation.

B. Provide product data on emergency lighting units, exit signs, emergency ballasts, and emergency fluorescent lamp power supply units.

C. Performance Curves/Data: Submit certified photometric data for emergency lighting units.

1.07 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Manuals: Submit maintenance instructions for inclusion in the operating and maintenance manuals.

PART 2 PRODUCTS

2.01 EMERGENCY LIGHTING UNITS

A. Provide emergency lighting units as scheduled on the Plans or approved equal.

2.02 EXIT SIGNS

A. Provide exit signs as scheduled on the Plans or approved equal.

2.03 ACCEPTABLE MANUFACTURERS – FLUORESCENT EMERGENCY BALLASTS

A. Bodine.

B. Iota.

C. Substitutions: Under provisions of Division 1.

2.04 FLUORESCENT EMERGENCY BALLAST

A. Standard T8 Unit: UL listed self-contained, with automatic transfer to battery supply on power failure, including test switch, AC ON pilot light, fully-automatic two-rate charger, End-Of-Life (EOL) detection, maintenance free nickel cadmium battery, and Class P, 120/277V power supply capable of operating a F34T12 or an F32T8 lamp with a minimum output of 1100 lumens for a minimum of 90 minutes. Provide self-diagnostics feature with illuminated test switch. Electronic circuitry shall be self-testing in design and automatically test emergency lighting for a minimum of 30 seconds every 30 days and 90 minutes once a year. Bodine #B50-ST or approved equal.

B. Low-Profile T5/T5HO Unit: UL listed self-contained, with automatic transfer to battery supply on power failure, including test switch, AC ON pilot light, fully-automatic two-rate charger, End-Of-Life (EOL) detection, maintenance free nickel cadmium battery, and Class P, 120/277V power supply capable of operating one F28T5 or F54T5/HO lamp with a minimum output of 1250 lumens for a minimum of 90 minutes. Bodine #LP600 or approved equal.

C. Test Switches:
   1. High Output Unit: Self-testing, as specified above.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install units plumb and level.

B. Aim directional lampheads to illuminate the path of egress.

3.02 FIELD QUALITY CONTROL

A. Tests: Perform tests listed below according to manufacturer's written instructions. Test unit functions, operations, and protective features. Adjust to ensure operation complies with Specifications. Perform tests required by NFPA 70, Articles 700 and 701. Perform tests on

completion of unit installation and after building circuits have been energized. Provide instruments to permit accurate observation of tests. Include the following tests:

1. Simulate power outage: Verify proper operation of each individual emergency power supply.
2. Verify emergency supply duration.
3. Verify operation of remote test switches
4. Provide reports for load test conducted on individual batteries.

B. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

3.03 ADJUSTING

A. Aim lamp on wall-mounted emergency lighting units to obtain the following illumination of egress pathway:

1. An average of 1 foot-candle.
2. A minimum at any point of 0.1 foot-candle measured along the path of egress at floor level.
3. Maximum-to-minimum illumination uniformity ratio of 40 to 1 shall not be exceeded.

B. Test emergency lighting equipment in accordance with the manufacturer's instructions and NECA/IESNA 500.

3.04 CLEANING

A. On completion of installation, inspect unit components. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and abrasions in finish to match original finish. Clean unit internally using methods and materials recommended by manufacturer.

3.05 DEMONSTRATION

A. Walk owner's representative through the emergency lighting system. Note how to maintain, test and troubleshoot all units. Provide maintenance schedule for NFPA required testing and note locations of remote test switches, and which units have self-diagnostic features.

END OF SECTION

SECTION 16611

STATIC UNINTERRUPTIBLE POWER SUPPLY

PART 1 GENERAL

1.01 WORK INCLUDED

A. UL 1778 listed Static Uninterruptible Power Supply (UPS).

B. Instruction of Owner Personnel (see Section 16010).

1.02 REFERENCES

A. ANSI/IEEE 446 - Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications.

B. ANSI/IEEE 493 - Recommended Practice for Design of Reliable Industrial and Commercial Power Systems.

C. ANSI/IEEE 519 - Guide for Harmonic Control and Reactive Compensation of Static Power Converters.

D. ANSI/NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum)

E. ANSI C62.41/IEEE 587.

F. FCC part 15, Class A.

G. OSHA.

H. UL Standard 1778, 4th Edition.

1.03 SYSTEM DESCRIPTION

A. System Configuration: Dual Input, on-line, double conversion type with reverse transfer configuration.

B. Components: System includes battery to provide continuous source of electrical power; phase controlled rectifier/charger to maintain battery charge and to provide input to pulse-width modulated (PWM) inverter when utility power is available; inverter to provide power to load during normal operation; static transfer switch to transfer load automatically and without disturbance between inverter and utility power; manual switch to bypass static switch for maintenance; input isolation transformers and filters to provide appropriate isolation and disturbance attenuation; redundant cooling fans, local emergency power shutoff (EPO) with provisions for remote EPO, integrated battery cabinet with circuit breakers to isolate the battery during maintenance, valve regulated lead acid battery cells in flame retardant cases, monitors, sensors, and control circuits.

C. Design Standards: In accordance with ANSI/IEEE 446, ANSI/IEEE 493, and ANSI/IEEE 519.

D. Seismic Design Criteria: Provide bracing and mounting of the UPS and associated battery cabinets to comply with International Building Code (IBC) requirements for an International Building Code (IBC) seismic group ‘D’ location.

1.04 MODES OF OPERATION

A. Normal - Utility Power Available: The load is continuously supplied by the UPS inverter. The rectifier/charger derives power from the Utility source and supplies DC power to the inverter and maintains battery in fully charged "float" condition.

B. Utility Power Failure: When the Utility power drops below preset limits or fails, the load shall be automatically supplied by the static inverter from the battery without any switching, interruption or disturbance in the power fed to the load.

C. Utility Power Returns: The rectifier/charger shall automatically restart, walk-in and gradually assume the inverter and battery recharge loads without any switching, interruption or disturbance in the power fed to the load.

D. Rectifier/Charger or Battery Failure: When inverter output deviates beyond specified limits the static switch transfers the load to synchronized Utility power without any switching, interruption or disturbance to the load. When inverter output returns to acceptable operation it shall be synchronized to Utility power and after a preset timing interval the static switch returns load to the inverter without any switching, interruption or disturbance to the power fed to the load.

E. Overload or Short Circuit: Static switch transfers load to Utility power during load in-rush and clearing of faulted branch circuits. Load automatically transfers back to inverter without disturbance after in-rush or fault is cleared.

F. Inverter Failure: Static switch transfers to Utility power without disturbance and remains on Utility power until manually returned to the UPS.

G. Maintenance Operation: The load is manually transferred to Utility power using the bypass switch. While the UPS is in the bypass mode the operation of the system or the static switch shall not affect power to load.

1.05 QUALITY ASSURANCE

A. Manufacturer: ISO 9000 certified company with a minimum of 10 years experience in the design, manufacture, and testing of solid state in UPS systems.

B. Prior to shipment the manufacturer shall fully and completely test the system including an operational discharge and recharge test on at least a one minute battery plant and shall operate system for 24 hours at full load before shipping.

1.06 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 16010.

B. Provide battery cabinet dimensions; battery type, size, dimensions, and weight; detailed equipment outlines, weight, and dimensions; location of conduit entry and exit; single-line diagram indicating metering, control, and external wiring requirements; heat rejection and air flow requirements.

C. Submit product data for major components, such as batteries, battery cabinets, the UPS, etc.. Include catalog sheets and technical data sheets to indicate physical data and electrical performance.

D. Submit manufacturer's installation instructions under provisions of Section 16010.

E. Include equipment installation outline, connection diagram for external cabling, internal wiring diagram, and written instruction for installation.

1.07 OPERATION AND MAINTENANCE DATA

A. Submit data under provisions of Section 16010.

B. Submit complete manufacturer’s Installation, Operation & Maintenance manuals including exploded views of all parts of the UPS, replacement parts list, electronic schematics of the complete UPS including all schematics of all circuit boards, troubleshooting and repair guides.

Include description of operation and servicing procedures, list of major components, recommended remedial and preventive maintenance procedures, and a spare parts list.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and protect products under provisions of Section 16010.

B. Protect equipment from extreme temperature and humidity by storing in a conditioned space.

C. Protect equipment from dust and debris by wrapping unit in dust tight cover and storing away from construction activity.

1.09 ENVIRONMENTAL REQUIREMENTS

A. Do not store or install unless temperature is maintained between 32º F and 104º F, at a relative humidity less than 95 percent (non-condensing).

1.10 WARRANTY

A. Battery: Provide written 1 year full warranty and 9 year pro-rata warranty under provisions of Section 16010. Pro-rated warranty shall be on straight line basis.

B. UPS System Warranty: Warrant the UPS module against defects in materials and workmanship for a period of 24 months from substantial completion. Warranty shall include the cost of travel, labor, parts, and service.

1.11 MAINTENANCE SERVICE

A. Provide the manufacturer's recommended preventive and full service maintenance contract for and maintenance and upkeep of the UPS system for one year from Date of Substantial Completion.

B. Maintenance contract shall include coverage of travel, labor, parts, and service.

1.12 SPARE PARTS

A. Provide spare parts under provisions of Section 16010.

B. Provide a complete set of the UPS manufacturer's recommended spare parts.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Eaton 9315 Series.

B. Liebert NX series.

C. Toshiba G8000 Series.

D. Substitutions: Under provisions of Section 16010.

2.02 SYSTEM RATINGS AND OPERATING CHARACTERISTICS

A. Environmental Conditions: The UPS shall be capable of operating without damage or degradation of operating characteristics in an ambient temperature range of 32°F to 105°F (0°C to 40°C) (77 +/- 9°F (25 +/- 5°C) for the batteries) with a relative humidity of 0 to 95% non-condensing at an altitude up to 6600 ft (2000 meters) above mean seal level.

B. System Continuous Rating: 225 KVA, 180 KW, over entire battery voltage range at 0.8 lagging power factor. Maintain output voltage within specified limits at any load from full load to no-load.

C. Battery Capacity: Capable of operating at full load for 7 minutes minimum with ambient temperature between 20 and 30°C.

D. Voltage Rating: Input - 480 volts 3 phase 3 wire plus ground; Output - 480 volts, 3 phase, 4 wire plus ground.

E. Input Voltage Limits: Plus 10 percent to minus15 percent of nominal.

F. Input Frequency: 60 Hz +/- 5 percent.

G. Input Current Limit: Adjustable to maximum of 125 percent of that required to operate at full load with battery bank on float charge.

H. Current Walk-In: Field selectable 5 or 20 seconds to full rated input current.

I. Load Power Factor Range: 0.9 leading to 0.5 lagging.

J. Harmonic Distortion of Input Current Wave Form: 10 percent maximum at full load.

K. Output Voltage Regulation:
   1. +/- 1 percent three phase RMS for balanced three phase load for the combined variation effects of input voltage, connected load, battery voltage, ambient temperature, and load power factor.
   2. +/- 2 percent three phase RMS for a 50 percent unbalanced load for the combined variation effects of input voltage, connected load, battery voltage, ambient temperature, and load power factor.
   3. +/- 5 percent during maximum overload of the system.

L. Output Voltage Adjustment: +/- 5 percent manual adjustment.

M. Output Free Running Frequency: 60 Hz +/- 0.5 percent.

N. Frequency Adjustment: +/- 2 percent.

O. Output Harmonic Distortion: Maximum 5 percent total harmonic distortion (THD) for linear loads and maximum 3 percent for any single harmonic, at rated frequency and voltage, from 10 percent load to full load and over battery voltage range.

P. Voltage Transient Response:
   1. +/- 4% for a 20% load step.
   2. +/- 5% for a 30% load step.
   3. +/- 8% for a 50% load step.
   4. +/- 1% on loss or return of AC input power.
   5. +/- 4% on manual transfer of 100% load.
   6. Recovery to within 1% of output voltage within 50 milliseconds.

Q. Phase Displacement:
   1. +/- 1 º for balanced loads.
   2. +/- 3 º for 50 percent unbalanced loads.

R. Three-phase Overload Ratings:
   1. 2000 percent for 2 cycles; via static switch.
   2. 150 percent for 30 seconds (without bypass source).
   3. 125 percent for 10 minutes (without bypass source).

S. Output Current Limit: 150 percent of rated output current.

T. Voltage Unbalance:
   1. Balanced load to 20% unbalanced load - +/- 1%.
   2. 50% unbalanced load - +/- 2%.

3. 100% unbalanced load - +/- 5%.

U. Fault Clearing: Sub-cycle current of at least 300%.

V. Efficiency: 93 percent at full load, 90 percent at 50 percent load, minimum. Measure efficiency of unit including battery and isolation transformer losses.

2.03 DESIGN AND CONSTRUCTION

A. Inverter Type: Transistorized, phase controlled, pulse-width modulated (PWM) design capable of providing the specified output.

B. Static Transfer Switch: A static transfer switch and bypass circuit shall be provided as an integral part of the UPS. The static switch shall have input, output and bypass circuit breakers and shall be a naturally commutated high-speed static (SCR-type) device rated to conduct full load current continuously. The switch shall have an overload rating of 125% rated load continuously, 200% rated load for thirty seconds and 2000% rated load for two cycles. The static transfer switch control logic shall contain an automatic transfer control circuit that senses the status of the inverter logic signals, operating and alarm conditions. The control circuit shall provide and uninterrupted transfer of the load to the bypass source, without exceeding the transient limits specified herein, when an overload or malfunction occurs within the UPS or for bypassing the UPS for maintenance. The transfer control logic shall automatically turn on the static transfer switch, transferring the load to the bypass source, after the transfer logic senses any of the following conditions:
1. Inverter overload capacity exceeded.
2. Critical AC load overvoltage or undervoltage.
3. Battery protection period expired.
4. UPS fault condition.

The transfer control logic shall inhibit an automatic transfer of the load to the bypass source if any of the following conditions are present:
1. Inverter/bypass voltage difference exceeding preset limits.
2. Bypass frequency out of limits.
3. Bypass out of synchronization range with inverter output.

Retransfer of the load from the bypass source to the inverter output shall be automatically initiated unless inhibited by manual control. The transfer control logic shall inhibit an automatic retransfer of the load to the inverter if any of the following conditions exist:
1. Bypass out of synchronization range with inverter output.
2. Inverter/bypass voltage difference exceeding preset limits.
3. Overload condition exists in excess of inverter full load rating.
4. UPS fault condition present.

C. Rectifier/Charger: Phase controlled, solid state SCR type with constant voltage/current limiting control circuitry. Sufficient to supply full load to inverter while recharging fully-discharged battery to 95 percent of the battery discharge power within ten (10) times the discharge time within the input current limits specified. Provide rectifier/charger with an output filter to limit ripple voltage to the battery to less than 2% RMS. Provide fast-acting fuses on power semiconductors to prevent cascading failures of power semiconductors.

D. Overvoltage Protection: Provide DC over voltage protection to limit DC voltage rise to a preset limit. If the DC voltage exceeds the limit the UPS shall shutdown automatically and initiate an uninterrupted load transfer to the static bypass line.

E. Input Transformers: Provide dry type input transformer factory installed inside the UPS cabinet. The input transformer shall have 480 volt delta input, 480 volt wye output. The transformers shall have copper windings and the hottest spot winding temperature shall not exceed the

temperature limit of the transformer insulation class within operating at full load at maximum ambient temperature.

F. Maintenance Bypass Switch: Provide a manually operated maintenance bypass switch incorporated into the UPS cabinet to directly connect the load to the output of the input transformer bypassing the rectifier/charger, inverter and static transfer switch. With the load powered from the maintenance bypass circuit it shall be possible to check out the operation of the rectifier/charger, inverter, battery and static transfer switch. A means to de-energize the static switch shall be provided when the UPS is in the maintenance bypass mode of operation.

G. Battery Circuit Breaker: Provide a battery circuit breaker to isolate the battery from the UPS. The breaker shall have an undervoltage release and auxiliary contacts. The circuit breaker shall be mounted in a separate wall mounted NEMA 1 enclosure. The breaker shall provide a manual disconnecting means, short circuit protection and overcurrent protection for the battery system. When opened there shall be no battery voltage in the UPS enclosure. The UPS shall be automatically disconnected from the battery by opening the breaker when the battery reaches the minimum discharge voltage level.

H. Monitoring and Control: The UPS shall be provided with a microprocessor based unit status display and controls section. All the operator controls and monitors shall be located on the front of the UPS cabinet. UPS startup, shutdown and maintenance bypass operations shall be accomplished by controls on the front of the cabinet. An advisory display and menu-driven user prompts shall be provided to guide the operator through system operation without the use of additional manuals. Pushbuttons shall be provided to display the status of the UPS and to test and reset visual and audible alarms. The monitoring functions shall be displayed on an alphanumeric LCD display and shall include:
   1. Menu driven display with text format selectable in five languages.
   2. Real time clock with time and date.
   3. Alarm history with time and date.
   4. Battery back-up memory.
   5. Provide metering as follows:
      a. Input AC voltage line to line and line to neutral for each phase.
      b. Input AC current for each phase.
      c. Input frequency.
      d. Battery Voltage.
      e. Battery charge/discharge current.
      f. Output AC voltage line to line and line to neutral for each phase.
      g. Output frequency.
      h. Percent of rated load being supplied by the UPS.
      i. Battery time left during battery operation.
   6. Provide alarm messages to local SCADA system as follows:
      a. Input power out of tolerance.
      b. Input phase rotation incorrect.
      c. Incorrect input frequency.
      d. Charger in reduced current mode.
      e. Battery charger problem.
      f. Battery failed test.
      g. Low battery warning (adjustable 1 to 99 minutes).
      h. Low battery shutdown.
      i. DC bus overvoltage.
      j. Bypass frequency out of range.
      k. Load transferred to bypass.
      l. Excessive retransfers attempted.
      m. Static switch failure.

n. UPS output not synchronized to input power.
o. Input power single phased.
p. Input voltage sensor failed.
q. Inverter leg overcurrent in X-phase.
r. Output undervoltage.
s. Output overvoltage.
t. Output overcurrent.
u. System output overloaded.
v. Load transferred to bypass due to overload.
w. Overload shutdown.
x. Control error.
y. Critical power supply failure.
z. Load transferred due to internal protection.
aa. External shutdown (remote EPO activated).
bb. Fan failure.
cc. Overtemperature shutdown impending.
dd. Overtemperature shutdown.

An audible alarm shall be activated by any of the above alarm conditions.

7. Provide status messages as follows:
   a. Normal operation.
   b. Load on maintenance bypass.
   c. Load on UPS.
   d. Load on static bypass.
   e. System shutdown.
   f. UPS on battery.

I. Provide a mimic panel to depict the single line diagram of the UPS. Provide LED indicators integrated within the single line diagram to illustrate the status of the UPS. Two LED's located on the diagram shall indicate whether UPS input and/or output power is present.

J. Provide means for on-line load testing of UPS including test points to allow easy adjustment and servicing. Provide means for testing static switch while load is bypassed to utility.

K. Mean Time Between Failures: 60,000 hours, minimum.

L. Cooling: Provide forced air cooled unit with redundant fans so that failure of any one cabinet cooling fan or fan circuit will not affect continued operation at full load and ambient temperature of 77 º F or lower.

M. Noise generated by the UPS under any condition of normal operation shall not exceed 65 dBA measured 1 meter from the surface of the UPS.

N. Operate battery floating, isolated from the UPS AC input and AC output. The battery may be resistance grounded through 5,000 - 10,000 ohms for the purpose of ground fault sensing.

O. Component Ratings: Adequate for expected service life of twenty years continuous duty, ten years without component replacement.

P. Construct equipment so each power component can be replaced without a soldering iron or special tools.

Q. Use front-panel removable plug-in control modules.

R. Provide input surge protection in accordance with ANSI C62.41-1980.

2.04 FABRICATION

A. All material of the UPS shall be new, of current manufacturer, free from all defects and shall not have been in prior service except as required during factory testing. The maximum working voltage, circuit and di/dt of all solid state power components and electronic devices shall not exceed 75% of the rating established by their manufacturer. The operating temperature of solid state component sub-assembly shall not be greater than 75% of their ratings. Electrolytic capacitors shall be computer grade and shall be operated at no more than 95% of their voltage rating at the maximum rectifier charging voltage.

B. Wiring practices, materials and coding shall be in accordance with the requirements of the National Electrical Code (NEC) (NFPA 70). All bolted connections of bus bars, lugs, and cables shall be in accordance with requirements of the NEC and other applicable codes and standards. All electrical power connections shall be torqued to the required value and marked with a visual indicator. Provisions shall be made for power cables to enter or leave from the top or bottom of the UPS cabinet. Identify internal wiring at each end of conductor. All energized terminals shall be shielded.

C. The AC output neutral shall be electrically isolated from the UPS cabinet. The UPS cabinet shall have an equipment grounding terminal installed and provisions for local bonding shall be provided.

D. The UPS unit shall be housed in a single, free standing ANSI/NEMA 250, Type 1 enclosure. Cabinet doors/covers shall have a tumbler lock and latch handle for gaining access. Casters and leveling feet shall be provided. Front access only shall be required for servicing, adjusting and installation. The UPS cabinet shall be structurally adequate and have provisions for hoisting, jacking and fork lift handling. The UPS cabinet shall be cleaned, primed and painted with the manufacturer’s standard color inside and out.

E. Electroplate brackets and securing hardware with corrosion resistant material. Secure bolts, studs and nuts with lock washers.

F. Equip air inlet with permanent type filters and pressurize cabinet, or use gaskets around door and panel openings to prevent entry of dirt.

2.05 BATTERY POWER PACK

A. The battery power pack shall include sealed, lead-acid valve regulated battery cells housed in the same cabinet with the UPS. Battery cells shall be mounted on slide out trays. Provide battery with impact resistant clear plastic case with explosion proof vents and ample space for plate growth without stressing container and cover.

B. Electrolyte Specific Gravity: No greater than 1.250 when fully charged and measured at 77 º F.

C. Ampere Hour Rating: Sufficient to supply direct current to inverter for outage period specified, with inverter operating at full rated output, to a discharge limit of not less than 1.67 volts per cell.

D. Battery Cabinet: Maximum of three-tier, all steel UBC seismic zone 4 construction, with plastic insulating rails at all points of contact with the battery case. Provide the cabinet with casters and leveling feet. Paint racks with acid resistant paint.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install UPS as shown on the Drawings, and in accordance with manufacturer's instructions.

B. All UPS's shall have signage for arc hazard installed. The marking shall be located to be clearly visible to qualified personnel before examination, adjustment, servicing or maintenance of the equipment. At a minimum the signage shall state the following:

Warning

Arc Flash and Shock Hazard

Appropriate PPE Required

3.02 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of this section and Section 16010.

B. Field Tests: Verify specification performance criteria; measure battery discharge and recharge times; simulate fault in each system component and utility power; operate unit at 77 º F for eight hours; at rated load using resistive load bank; and other tests as recommended by manufacturer.

3.03 MANUFACTURER'S FIELD SERVICES

A. Provide manufacturer's field services under provisions of Section 16010.

B. Include services of a factory trained and certified technician to supervise initial start-up, adjustments, final connections, system testing and instruction of Owner personnel.

END OF SECTION

SECTION 16622

PACKAGED ENGINE GENERATOR SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Packaged engine generator system.

B. Automatic transfer switch.

C. Remote radiator.

D. Heat exchanger.

E. Exhaust silencer and fittings.

F. Fuel fittings and day tank.

G. Remote control panel.

H. Battery and charger.

I. Walk-in enclosure.

1.02 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Section 15450 - Plumbing Equipment: Connection to bulk tank.

B. Section 15515 - Hydronic Piping: Installation of exhaust silencer and fittings.

1.03 RELATED SECTIONS

A. Section 15260 - Piping Insulation.

B. Section 15540 - HVAC Pumps.

C. Section 15890 - Ductwork.

D. Section 15910 - Ductwork Accessories.

E. Section 15936 - Air Outlets and Inlets.

F. Section 16496 – Enclosed Transfer Switch.

1.04 REFERENCES

A. ANSI/NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

B. ANSI/NEMA MG 1 - Motors and Generators.

C. ANSI/NFPA 70 - National Electrical Code.

D. ANSI/NEMA AB 1 - Molded Case Circuit Breakers.

E. UL 2200 - Standard for Stationary Engine Generator Assemblies: The genset shall be listed to UL2200 or submitted to an independent third party certification process to verify compliance as installed.

F. IEEE446 - Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications

G. International Building Code (IBC), Chapter 16 – Structural Design.

H. FCC Part 15 Subpart B

1.05 SYSTEM DESCRIPTION

A. Engine generator system to provide source of standby power.

B. System Capacity: 350 kW, 437.5 kVA at elevation of 300 feet above sea level, and ambient temperature of 82º F; standby rating using engine-mounted radiator.

C. Operation: In accordance with ANSI/NFPA 99.

1.06 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 1.

B. Submit shop drawings showing plan and elevation views with overall and interconnection point dimensions, fuel consumption rate curves at various loads, ventilation and combustion air requirements, and electrical diagrams including schematic and interconnection diagrams.

C. Submit product data showing dimensions, weights, ratings, interconnection points, and internal wiring diagrams for engine, generator, control panel, battery, battery rack, battery charger, exhaust silencer, vibration isolators, day tank, radiator, and remote annunciator.

D. Provide structurally engineered shop drawings as specified in Section 16070 for seismic restraint of all equipment required by the 2009 IBC, Chapter 16 (1621). Equipment requiring structural shop drawings includes, but is not limited to the following: Skid-mounted engine/generator, and vibration isolators.

E. Submit manufacturer's installation instructions under provisions of Division 1.

1.07 PROJECT RECORD DOCUMENTS

A. Submit record documents under provisions of Division 1.

B. Accurately record location of engine generator and mechanical and electrical connections.

1.08 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Division 1.

B. Include instructions for the following:
1. Normal operation.
2. Routine maintenance requirements, including replacement of filters.
3. Starting battery inspection/maintenance.
4. System coolant and other fluid inspection and replacement.
5. Oil sampling and analysis for engine wear.
6. Emergency maintenance procedures.

C. Provide manufacturer’s service manuals for all equipment, including but not limited to the following: Engine, generator, radiator, and fuel tank.

1.09 QUALIFICATIONS

A. Manufacturer: Company specializing in packaged engine generator system with minimum twenty five years years documented experience, and ISO9001 certification.

B. Supplier: Authorized distributor of engine generator manufacturer with authorized maintenance facility and personnel located within 100 miles of the City of Unalaska.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 1.

B. Store and protect products under provisions of Division 1.

C. Accept packaged engine generator set and accessories on site in container and verify damage.

D. Protect equipment from dirt and moisture by securely wrapping in heavy plastic.

1.11 WARRANTY

A. Provide two year, 1500 hour warranty under provisions of Division 1. The complete electrical power system (generator set, controls, automatic transfer switch and associated switches and accessories) shall be warranted by the manufacturer against defects in materials and workmanship for a period of two years or 1500 hours, whichever occurs first from the date of beneficial occupancy. Warranty shall include repair parts, labor, reasonable travel expense necessary for repairs at the job site, labor to remove/reinstall equipment, and expendables (lubricating oil, filters, antifreeze, and other service items made unusable by the defect) used during the course of repair. There shall be no deductibles applied to the warranty.

1.12 MAINTENANCE SERVICE

A. Furnish service and maintenance of packaged engine generator system for one year from Date of Substantial Completion. The maintenance service shall include two semi-annual inspections and test run the engine to perform manufacturers recommended preventative maintenance service on the equipment furnished.

B. The engine-generator supplier shall maintain 24-hour parts and service capability within 100 miles of the project site. The distributor shall stock parts as needed to support the generator set package for this specific project. The supplier must carry sufficient inventory to cover no less than 80% parts service within 24hrs and 95% within 48 hours.

1.13 PREVENTIVE MAINTENANCE AGREEMENT

The authorized Caterpillar dealer shall provide a preventive maintenance agreement using qualified factory trained service personnel, for a period of 1-year minimum. The dealer shall provide genuine Caterpillar parts and filters, shall provide all recommended fluids, dealer labor, travel labor and travel mileage to complete the suggested preventive maintenance as defined in the manufacturer's Operation and Maintenance Manual.

1.14 EXTRA MATERIALS

C. Submit maintenance materials under provisions of Division 1.

D. Furnish one set of tools required for preventative maintenance of the engine generator system. Package tools in adequately sized metal tool box.

E. Provide two additional sets of each fuel, oil, and air filter element required for the engine generator system.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Caterpillar.

B. Substitutions: Under provisions of Division 1.

2.02 ENGINE

A. Type: Water-cooled inline or V-type, four stroke cycle, compression ignition Diesel internal combustion engine.

B. Rating: Sufficient to operate rated load at 10 percent overload for one hour at specified elevation and ambient limits.

C. Fuel System: Appropriate for use of No. 1 (Arctic grade) fuel oil.

D. Engine Speed: 1800 rpm.

E. Governor: Electronic Engine Control Module (ECM) with 24-volt DC Electric Actuator. The ECM shall be enclosed in an environmentally sealed, die-cast aluminum housing which isolates and protects electronic components from moisture and dirt contamination. Speed droop shall be adjustable from 0 (isochronous) to 10%, from no load to full rated load. Steady state frequency regulation shall be +/- 6 RPM. Speed shall be sensed by a magnetic pickup off the engine flywheel ring gear. A provision for remote speed adjustment shall be included. The ECM shall adjust fuel delivery according to exhaust smoke, altitude and cold mode limits. In the event of a DC power loss, the forward acting actuator will move to the minimum fuel position.

F. Safety Devices: Engine shutdown on high water temperature, high lube oil temperature, low oil pressure, overspeed, and engine overcrank. Limits as selected by manufacturer.

G. Engine Starting: Electric DC starting system capable of three complete cranking cycles without overheating. Starters shall have positive engagement, number and voltage of starter motors in accordance with manufacturer's instructions. Include remote starting control circuit, with MANUAL-OFF-REMOTE selector switch on engine-generator control panel.

H. Engine Jacket Heater: UL499 listed and labeled thermal circulation type water heater with integral thermostatic control, sized to maintain engine jacket water at 90º F, and suitable for operation on 120 volts AC.

I. Radiator: Engine mounted radiator using 50/50 glycol coolant, with blower type fan, sized to maintain safe engine temperature in ambient temperature of 104º F and freeze protection to -50 ºF. Radiator Air Flow Restriction: 0.5 inches of water, maximum. Rotating parts shall be guarded against accidental contact.

J. Engine Accessories:
   1. Oil Pump: Positive displacement, mechanical, full pressure, lubrication oil pump.
   2. Fuel Pump: An engine driven, mechanical, positive displacement fuel pump. Include fuel priming pump.
   3. Fuel filter with a replaceable spin-on canister element. Provide Racor #500FG or approved equal pre-filter, with water shutdown sensor tied to control panel.
   4. Replaceable dry element air cleaner with restriction indicator.
   5. Water pump.
   6. Lube Oil Drain: Extend the lube oil drain to the outside of the generator skid using Areoequip fittings. Install a Nibco T - 113 shut off valve on the hose at an accessible location of the unit and cap the end of the hose with a ¾" NPT cap.

K. Mounting: Provide unit with suitable spring-type vibration isolators and mount on structural steel base.

2.03 GENERATOR

A. Generator: ANSI/NEMA MG 1; three phase, six pole, reconnectible brushless synchronous generator with brushless exciter.

B. Rating: 350 kW, 437.5 kVA, at 0.8 power factor, 480Y/277 volts, 60Hz at 1800 rpm.

C. Insulation: ANSI/NEMA MG 1, Class F.

D. Temperature Rise: 130º C standby.

E. Enclosure: ANSI/NEMA MG 1; open drip proof.

F. Voltage Regulation: The digital voltage regulator shall be microprocessor based with fully programmable operating and protection characteristics. The regulator shall maintain generator output voltage within +/- 0.25% for any constant load between no load and full load. The regulator shall be capable of sensing true RMS in three phases of alternator output voltage, or operating in single phase sensing mode. The voltage regulator shall include a VAR/Pf control feature as standard. The regulator shall provide an adjustable dual slope regulation characteristic in order to optimize voltage and frequency response for site conditions.

The voltage regulator shall communicate with the Generator Control Panel via a J1939 communication network with generator voltage adjustments made via the controller keypad. Additionally, the controller shall allow system parameter setup and monitoring, and provide fault alarm and shutdown information through the controller. A PC-based user interface shall be available to allow viewing and modifying operating parameters in a windows compatible environment.

G. Frequency Regulation: Isochronous from steady state no load to steady state rated load. Random frequency variation with any steady load from no load to full load shall not exceed plus or minus 0.25%.

H. The diesel engine-generator set shall be capable of step load pick up of 100% nameplate kW and power factor, less applicable derating factors, with the engine-generator set at operating temperature.

I. The alternator shall produce a clean AC voltage waveform, with not more than 5% total harmonic distortion at full linear load, when measured from line to neutral, and with not more than 3% in any single harmonic.

J. Generator Leads: The generator leads shall be brought out and terminated on a unit-mounted generator circuit breaker. The generator leads shall have sufficient length to allow for any connection configuration. Provisions shall be provided to prevent generator operation if any overcurrent or disconnecting means between the prime mover and the load is opened.

2.05 GENERATOR MODULE

A. Manufacturer: To be furnished by Marsh Creek LLC or approved substitution only. Manufacturer shall have minimum 2 years' experience in local climate with arctic enclosure, and be a NRTL panel shop, with UL, ETL, or other 3rd party recognition.

B. Structural Framing:
   1. Framing consists of rolled structural shapes in accordance with ASTM-A36 specifications.
   2. All connections shall be of all welded design in accordance with the International Building Code (IBC) latest edition and amendments.

3. The roof shall slope in one direction. Minimum 4:1 horizontal to vertical pitch.
4. All structural steel shall be primed with a marine alkyd primer proceeding fabrication. No top coat is applied.

C. Exterior Composite Panels:
1. Roof, Soffit and wall panels shall consist of 4" nominal polyurethane foam composite panels suitable for outdoor environments with suitable through fasteners.
2. All panels shall feature tongue and groove joints tested in accordance with ASTM-E331 and ASTM-E283 for dust infiltration and water penetration. All Panel joints shall be foam to foam contact only eliminating frost creep, all voids in corners shall be foam filled.
3. All panels shall be designed and approved to Factory Mutual (FM4880) and Class 1 fire rated construction. All panels shall be UL classified by UL subject 1040.
4. Flame spread: 10
Smoke development: 125
R-value: 26(actual)
Temperature range: -70° F to +100°F.
5. Interior and exterior steel shall be of galvanized, G-90 finish, factory painted with baked on thermosetting silicone modified polyester coatings. Twenty year guarantee on finish. Color shall be white inside and exterior color shall match the water treatment plant.
6. Exterior doors shall be of freezer type complete with arctic grade seals and access hardware. See section 08710 for additional information on hardware.

D. Support Baseframe:
1. The generator set and all ancillaries shall be supported on the prefabricated steel baseframe designed to withstand the forces of damage fatigue as a result of transportation and placement at site.
2. There shall be two longitudinal wide flange beams provided as the main support positioned inward of the perimeter and to provide skidding as required. Additional thermal break between the rails and the enclosure shall be provided.
3. Floor plate shall consist of 3/16" diamond plate galvanized steel properly braced and stiffened to prevent "oil canning." All seams shall be stitch welded. At the Contractor's option an epoxy coated floor system may be used in lieu of the diamond plate.
4. Four lifting eyes shall be provided in relation to the center of gravity.

E. Electrical:
1. The following electrical components shall be supplied and installed in accordance with UL and the National Electric Code (NEC):
a. 100 amp lighting and service panel complete with 100 amp main and required breakers. Connect panel to plant distribution system as shown on the plans.
b. 3 kW unit heater with built in thermostat.
c. Install 4'-2 tube fluorescent fixtures, H.E. Williams Series 86 or equal with T5HO lamps, electronic ballasts, high impact acrylic diffuser and "damp location" listing to provide an average lighting level of 50 footcandles throughout the module. Provide pilot light switch at entry to module to control interior lights.
d. One emergency light, dual heads rated at 75 watts and complete with battery back-up.
e. One exterior, 40 watt LED wall pack type 'C' light above man door with integral photocell activation.
f. A minimum of two interior duplex receptacles in addition to those required to operate the battery charger and engine block heater.
g. All components shall be wired in accordance with Specification Sections 16010, 16111, and 16120.
h. Maintain NEC 110.26 required access and working clearance about electrical equipment.

F. Ventilation:
   1. All motor operated dampers and motors shall be provided and pre-wired to a relay panel with controls.
   2. All openings shall include artic 'T' type weatherhoods and birdscreens. Minimum height above module floor of 6'-0".
   3. Intake dampers shall be provided to minimize thermal shock during winter and prevent snow infiltration. For summer operation, include motor operated dampers at the opposite side of the engine generator room to provide suitable cross flow ventilation.
   4. Ventilation of the module shall be designed with a recirculating air plenum for the engine sized accordingly for the air flow requirements.
   5. The temperature of the room shall be monitored by a thermostat which shall operate a modulating damper assembly which in turn shall be connected to the radiator discharge and the recirculating air plenum. The plenum shall allow the warm air from the radiator discharge to enter back into the power pant to mix with incoming cold air.

G. Fire Suppression System:
   1. Provide complete FM-200 fire suppression system with heat detector automatic activation, and manual activation pull stations at each exit. System shall be monitored by main facility fire alarm panel.
   2. Provide for engine shutdown, ventilation system shutdown and dampers to close upon activation.

2.06 ACCESSORIES

A. Exhaust Silencer: Critical grade silencer, with a minimum overall attenuation level of 40 dB(A) and a maximum exhaust pressure drop not to exceed the engine manufacturer's recommendations at the rated engine exhaust gas flow rate and temperature. Provide with ANSI 150# companion flanges and flexible stainless steel exhaust fitting, suitable for horizontal orientation with end entry and end exit, sized in accordance with engine manufacturer's instructions. Dual exhaust engines shall be provided with one silencer similar to the above combining the two exhaust outlets into a single outlet.

B. Day Tank: 100 gallon day tank unit with dual integral pumps and level control. Include flexible fuel line connections, fuel gauge, check valve, high fuel level alarm contact, and indicating light. Operate pump with motor rated 120 volts AC. Provide tank suitable for use in seismic design group 'D'.

C. Batteries: Heavy duty, diesel starting type lead-acid storage batteries, sized as recommended by the engine/generator set manufacturer for starting the set at -20°F ambient. Match battery voltage to starting system. Include necessary cables and clamps.

D. Battery Tray: Non-metallic battery boxes with covers and hold-downs, treated for electrolyte resistance and constructed to contain spillage of electrolyte. Provide with seismic restraints to secure batteries during earthquakes. The battery housing shall be mounted inside the engine/generator skid base

E. Battery Charger/Inverter: Sens Energenius IQ model Q024012TL512C or approved equivalent. Provide overload protection, full wave rectifier, DC voltmeter and ammeter, and 120 volts AC fused input. Provide wall-mounted enclosure to meet ANSI/NEMA 250, Type 1 requirements. Operational monitors shall provide visual output along with individual form C contacts rated at 4 amp, 120 VAC, 30 VDC for remote indication of:
   1. Loss of AC power: Red light.
   2. Low battery voltage: Red light.
   3. High battery voltage: Red light.
   4. Power on: Green light, no relay contact.

F. Line Circuit Breaker: NEMA AB 1 molded case circuit breaker on generator output with integral thermal and instantaneous magnetic trip in each pole; sized in accordance with ANSI/NFPA 70. Include battery-voltage operated shunt trip, connection to open circuit breaker on engine failure. Mount unit in enclosure to meet ANSI/NEMA 250, Type 1 requirements. Provide minimum one form c auxiliary contact for open/close verification in addition to any used by generator manufacturer.

G. Engine-Generator Control Panel: Solid-state, microprocessor based, generator set mounted. The control panel shall be designed and built by the engine manufacturer. The control shall provide all operating, monitoring, and control functions for the generator set. The control panel shall provide real time digital communications to all engine and regulator controls via SAE J1939.

A. Environmental

The generator set control shall be tested and certified to the following environmental conditions:

1. –40°C to +70°C Operating Range

2. 100% condensing humidity, 30°C to 60°C

3. IP22 protection for rear of controller; IP55 when installed in control panel

4. 5% salt spray, 48 hours, +38°C, 36.8V system voltage

5. Sinusoidal vibration 4.3G's RMS, 24-1000Hz

6. Electromagnetic Capability (89/336/EEC, 91/368/EEC, 93/44/EEC, 93/68/EEC, BS EN 50081-2, 50082-2)

7. Shock: withstand 15G

B. Functional Requirements

The following functionality shall be integral to the control panel.

1. The control shall include a minimum 33 x 132 pixel, 24mm x 95mm, positive image, transflective LCD display with text based alarm/event descriptions.

2. The control shall include a minimum of 3-line data display

3. Audible horn for alarm and shutdown with horn silence switch

4. Standard ISO labeling

5. Multiple language capability

6. Remote start/stop control

7. Local run/off/auto control integral to system microprocessor

8. Cooldown timer
9. Speed adjust
10. Lamp test
11. Emergency stop push button
12. Voltage adjust
13. Voltage regulator V/Hz slope - adjustable
14. Password protected system programming

C. Digital Monitoring Capability

The controls shall provide the following digital readouts for the engine and generator. All readings shall be indicated in either metric or English units

Engine

1. Engine oil pressure
2. Engine oil temperature
3. Engine coolant temperature
4. Engine RPM
5. Battery volts
6. Engine hours
7. Engine crank attempt counter
8. Engine successful start counter
9. Service maintenance interval
10. Real time clock
11. Engine exhaust stack temperature
12. Engine main bearing temperature

Generator

1. Generator AC volts (Line to Line, Line to Neutral and Average)
2. Generator AC current (Avg and Per Phase)
3. Generator AC Frequency

4. Generator kW (Total and Per Phase)
5. Generator kVA (Total and Per Phase)
6. Generator kVAR (Total and Per Phase)
7. Power Factor (Avg and Per Phase)
8. Total kW-hr
9. Total kVAR-hr
10. % kW
11. % kVA
12. % kVAR
13. Generator bearing temperature
14. Generator stator winding temperature

Voltage Regulation

1. Excitation voltage
2. Excitation current

H. Local and Remote Annunciator Panels:

Local Annunciator (NFPA 99/110, CSA 282)

Provide a local, control panel mounted, annunciator to meet the requirements of NFPA 110, Level 1.

1. Annunciators shall be networked directly to the generator set control

2. Local Annunciator shall include a lamp test pushbutton, alarm horn and alarm acknowledge pushbutton

3. Provide the following individual light indications for protection and diagnostics

a. Overcrank

b. Low coolant temperature

c. High coolant temperature warning

d. High coolant temperature shutdown

e. Low oil pressure warning

f. Low oil pressure shutdown

g. Overspeed

h. Low coolant level

i. EPS supplying load

j. Control switch not in auto

k. High battery voltage

l. Low battery voltage

m. Battery charger AC failure

n. Emergency stop

o. Spare

p. Spare

Remote Annunciator (NFPA 99/110, CSA 282)

Provide a remote annunciator to meet the requirements of NFPA 110, Level 1.

1. The annunciator shall provide remote annunciation of all points stated above and shall incorporate ring-back capability so that after silencing the initial alarm, any subsequent alarms will sound the horn.

2. Ability to be located up to 500 ft from the generator set

I. Heaters: Provide manufacturer's recommended heaters with thermostatic controls to keep engine oil pan, engine block, generator controls, and generator windings within manufacturer's recommended temperature at 55^{o}F. Mounting: The complete engine/generator package shall be mounted on a common, self-supporting, low profile, structural steel skid base with rubber in shear vibration isolators between the engine and base and spring type vibration isolators with seismic snubbers between the base and the module. The base shall extend from the rear end of the generator to the most forward point of the engine and shall be predrilled to accept a 4/0 AWG copper grounding conductor.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work and field dimensions are as shown on Drawings.

B. Verify that required utilities are available in proper location and ready for use.

C. Beginning of installation means installer accepts existing conditions.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Ground and bond generator and other electrical system components in accordance with NEC requirements and as shown on the drawings. There shall be one common bonding point for the entire system.

C. Maintain adequate access for equipment so that a 200 lb, 6ft tall person will be able to perform maintenance and repair.

3.03 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Division 1.

B. Provide two (2) 2 hour load tests utilizing a portable test bank. Simulate power failure including operation of transfer switch, automatic starting cycle, and automatic shutdown, and return to normal. Demonstrate all automatic features as directed by the Owner's Representative. Load bank testing shall be done as follows:
   1. 30 minutes at 50% rated load.
   2. 30 minutes at 75% rated load.
   3. 60 minutes at 100% rated load.

C. During test, record the following at 20 minute intervals:
   1. Kilowatts.
   2. Amperes.
   3. Voltage.
   4. Coolant temperature.
   5. Room temperature.
   6. Frequency.
   7. Oil pressure.

D. Test alarm and shutdown circuits by simulating conditions.

E. Upon completion of the load bank test, provide a test under full available (building) load for 2 hours for witness by the Authority Having Jurisdiction and the Owner's Representative. Simulate power failures from ATS with load transfer and normal cool-down cycle. Record voltage, current, and frequency during building load test. Note any required adjustments. Furnish record of tests to the Owner.

3.04 MANUFACTURER'S FIELD SERVICES

A. Prepare, start, test, and adjust systems under provisions of Division 1.

3.05 ADJUSTING

A. Adjust work under provisions of Division 1.

B. Adjust generator output voltage and engine speed.

3.06 CLEANING

A. Clean work under provisions of Division 1.

B. Clean engine and generator surfaces. Replace oil and fuel filters.

3.07 DEMONSTRATION

A. Provide systems demonstration under provisions of Division 1.

B. Describe loads connected to standby system and restrictions for future load additions.

C. Simulate power outage by interrupting normal source, and demonstrate that system operates to provide standby power.

END OF SECTION

SECTION 16724

ADDRESSABLE FIRE ALARM AND SMOKE DETECTION SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Contractor designed and installed addressable fire alarm and smoke detection system. This is a performance type specification describing the minimum acceptable fire alarm system. The Contractor shall design and install the fire alarm and smoke detection system in accordance with the requirements of NFPA 72 and ADAG. The fire alarm devices on the drawings are shown in suggested locations. The final locations of all devices shall be solely determined by the Contractor and shall be in accordance with NFPA 72 and ADAG.

1.02 RELATED SECTIONS

A. Division 15 - Sprinkler System, pre-action sprinkler system.

B. Section 16111 - Conduit.

C. Section 16120 - Wire and Cable.

D. Section 16130 - Boxes.

E. Section 16195 – Electrical Identification: Device labels.

1.03 REFERENCES

A. NFPA 72 - National Fire Alarm Code.

B. NFPA 101 - Life Safety Code.

C. International Mechanical Code (IMC).

D. Americans with Disabilities Act Guidelines (ADAG).

E. ANSI S3.41 - Audible Emergency Evacuation Signals.

1.04 REGULATORY REQUIREMENTS

A. System: UL and FM listed.

B. Conform to the requirements of UL 864, 9th Edition.

C. Conform to requirements of NFPA 101.

D. Conform to requirements of ADAG.

E. Install system in accordance with NFPA 72.

1.05 SYSTEM DESCRIPTION

A. Fire Alarm System: Contractor designed and installed, microprocessor controlled manual and automatic fire alarm system with individually addressable initiating devices. The Contractor shall design and install the fire alarm and smoke detection system in accordance with the requirements of these specifications, NFPA 72, NFPA 101, ANSI A17.1, and the ADAG. The fire alarm devices on the drawings are shown in suggested locations. The Contractor shall modify these device locations as necessary to accommodate actual architectural, structural, or mechanical conditions, at no cost to the Owner.

B. System Supervision: Provide electrically-supervised class B, addressable fire alarm system with fault tolerant supervised signaling line circuits and notification appliance circuits. Occurrence of single ground or open condition in signaling line circuit or notification appliance circuit places circuit in TROUBLE mode. Component or power supply failure places system in TROUBLE mode. Occurrence of single ground or open condition in signaling line circuit does not disable that circuit from transmitting in ALARM. Occurrence of single ground or open condition on notification appliance circuit does not disable that circuit from transmitting in ALARM.

C. Alarm Sequence of Operation: Actuation of manual fire alarm station or automatic initiating device causes system to enter ALARM, which includes the following operations:
   1. Sound and display local fire alarm notification appliances with ANSI S3.41 compliant temporal signal and synchronized flash.
   2. Transmit alarm signal to activate the digital alarm communicator automatic telephone dialer via Voice over Internet Protocol network.
   3. Indicate location and address of device in alarm on fire alarm control panel..
   4. Record the time, date and location of the alarm in the fire alarm panels' accessible history database.
   5. Transmit signal for shutdown of all building supply and return air fans.
   6. Transmit non-coded signal to remote station equipment via VoIP telephone system.

D. Alarm Reset: Key-accessible RESET function resets alarm system out of ALARM if alarm has cleared.

E. Trouble Sequence of Operation: System trouble, including grounding or open circuit of signaling line or notification appliance circuits, or power or system failure causes system to enter TROUBLE mode, including the following operations:
   1. Activate visual and audible trouble alarm by device at the fire alarm panel.
   2. Activate visual and audible trouble alarm by device [area of building] at annunciator panel.
   3. Manual ACKNOWLEDGE function at control panel silences audible trouble alarm; visual alarm is displayed until initiating trouble is cleared.
   4. Record the time, date and location of the trouble condition in the panel's accessible history database.
   5. Transmit alarm signal to activate the digital alarm communicator.

F. Drill Sequence of Operation: Manual DRILL function causes ALARM mode operation to sound and display local fire alarm notification appliances.

G. Sprinkler System Water Flow Sequence of Operation: Water flow in sprinkler system shall cause the fire alarm control panel to enter the alarm state.

H. Sprinkler System Valve Tamper Sequence of Operation: Activation of sprinkler valve tamper switch shall cause the fire alarm control panel to display a supervisory trouble indicator.

I. Lamp Test: Manual LAMP TEST function causes each indicator lamp/LED at the fire alarm control panel and the annunciator panel to illuminate.

J. The system shall be 100% field programmable for additions and deletions, and shall be capable of being expanded and field programmed at any time from the fire alarm control panel with a plug-in programmer without returning the devices or operating system to the factory for program change. System software and training shall be provided to the Owner as part of this contract.

K. The fire alarm control panel shall report and identify the failure of any device connected to the system, a device removed from a signaling line or notification appliance circuit, or a transmitting device component failure while all other line devices on the channel shall continue to function. The control panel shall report failures by specific channel and address number and permanently record the event including time and date on the system database.

L. Addressable control relays connected to the system shall be continuously monitored for proper state and position of contacts. Incorrect positions shall be automatically corrected by command from the control panel. If control relay fails to respond to the corrective command; the trouble signal shall sound, and the panel shall identify and permanently record the location of the fault. The control panel shall also monitor addressable control relays for proper state (position) after the system has commanded the relay to operate. Failure of the control relay to operate (change state) shall cause the panel to generate a trouble signal, identify and permanently record the location of the fault.

1.06 QUALIFICATIONS

A. The installation of the system shall conform to the State of Alaska requirements and be supervised by a representative with a current State Fire Alarm License.

B. Manufacturer: Company specializing in addressable smoke detection and fire alarm systems with five years documented experience.

C. Installer: Installation of the system shall be 100% field checked by a factory trained and authorized NICET Level III technician certified in the Fire Alarm System Program. The actual supervising technician must be approved prior to start of work.

D. System Certifier: Company specializing in smoke detection and fire alarm systems certified by UL as an agency with the authority to provide a “Certificated Alarm System”.

1.07 SUBMITTALS

A. Submit product data under the provisions of Division 1.

B. Submit manufacturer's installation instructions.

C. Submit shop drawings prepared and signed by a NICET Level III technician certified in fire alarm systems under the provisions of Division 1. Shop drawings shall have the following requirements:
   1. The Shop Drawings shall be reproduced electronically from a Master Copy supplied in digital format. Electronic copy of the Contract Drawings will be available at no charge to use as base plan for generation of electronic submittal. Shop Drawings shall be printed at Contract Drawing size and scale of floor plans on Shop Drawings shall match Contract Drawings.
   2. All text on the drawings shall be legible without magnification when the shop drawings are reduced to 11” x 17”.
   3. Provide minimum 1/8” scale floor plans with all new fire alarm control and auxiliary panels, field devices, raceway and conductor routing, quantities and connection requirements for every component.
   4. Provide point-to-point system wiring diagrams showing interconnection of all devices.
   5. Provide a riser diagram showing all devices on each NAC, SLC, and auxiliary circuit connected to the fire alarm control panel. Individual device addresses on riser diagram are not required for initial shop drawing submittal but shall be provided on the as-built drawings.
   6. Provide calculations to support battery size selection. Provide voltage drop calculations for each SLC and NAC circuit. Show the voltage drop at the furthest notification appliance from the control panel. Show all formulas and acceptable limits for all calculations. All calculations shall be shown on the shop drawings.

D. Submit shop drawings and product data to the State Fire Marshal for review and approval. All shop drawings and product data shall be reviewed and approved by the authority having jurisdiction prior to procurement and installation of materials or devices for the system.

E. Device Names: All device names that are displayed on the LCD text annunciators in the fire alarm panel and remote text annunciator panels shall be approved by the Owner. The Contractor shall request a list of approved room names for the facility prior to programming the fire alarm panel or any field devices.

1.08 PROJECT RECORD DRAWINGS

A. Submit documents under the provisions of Division 1.

B. Accurately indicate actual locations of notification appliances, initiating devices, fire alarm control panel, annunciators, etc.

C. Provide Point to Point as-built wiring diagrams of the entire Life Safety System as installed. This shall include all connected devices with actual addresses and locations of all T-taps. All drawings shall be provided in AutoCAD .DWG format. Paper plots of each sheet shall also be provided.

1.09 OPERATION AND MAINTENANCE DATA

A. Submit operating instructions and maintenance and repair procedures under the provisions of Division 1.

B. Include manufacturer representative's letter stating the system is operational.

C. Include an 11" x 17" set of the fire alarm system project record drawings and dwg file.

D. Include a completed copy of the NFPA 72 Inspection and Testing Form and the completed application for the UL Certificated Alarm System.

1.10 DEMONSTRATION AND TRAINING

A. The Manufacturer's Representative shall be responsible for an on-site demonstration of the operation of the system and initial staff training.

B. Under the provisions of Division 1 and Section 16010, provide formal instruction in the operation, maintenance, and troubleshooting of all equipment, provided at the project site with manufacturer's representative with the Owner's personnel

1.11 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site, store and protect, under provisions of Division 1.

1.12 EXTRA MATERIALS

A. Provide spare parts under provisions of Division 1.

B. Provide two keys of each type.

C. Provide four addressable smoke detectors.

D. Provide two 135°F addressable heat detectors.

E. Provide one fire alarm horn/strobe.

F. Provide two fire alarm strobe lights.

G. Provide one set of each type of fuse in the system.

1.13 WARRANTY

A. The Contractor shall be able to provide initial contact on warranty service and/or service contract requests from their principal location within eight (8) hours of notification. During the

warranty period, the Contractor may choose to attempt troubleshooting of the system by telephone, with the facility maintenance staff. If the problem cannot be resolved within 24 hours, the Contractor shall travel to the facility on the next available flight to repair the system. Travel and expenses shall be at no additional expense to the Owner.

1.14 MAINTENANCE CONTRACT

A. As part of this project, include the UL required maintenance of the fire alarm system for one year from the date of substantial completion for the project as required to maintain the system as a UL Certificated Alarm System. At the end of one year, the Owner shall be given the option of extending or canceling the maintenance of the system to maintain the UL certification.

B. Thirty days prior to the expiration of the one year of maintenance described above, the system certifier shall perform sensitivity tests on all area and duct smoke detectors and replace any detectors that are outside of the manufacturer's listed range at no cost to the Owner.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Edwards Systems Technology (EST)

B. Siemens Apogee Life Safety.

C. Ceberus Pyrotronics.

D. Fire Control Instruments (FCI).

E. Honeywell.

F. Johnson Controls.

G. Simplex.

H. Substitutions: Under provisions of Division 1.

2.02 FIRE ALARM AND SMOKE DETECTION CONTROL PANEL

A. Control Panel: Microprocessor controlled, addressable panel with modular construction and surface wall-mounted enclosure.

B. Power Supply: Adequate to serve control panel modules, initiating devices, notification appliances, remote annunciators, door holders, fire/smoke dampers, relays, duct smoke detectors, etc. plus 25 percent spare capacity to allow for future system load growth. Include battery-operated emergency power supply with capacity for operating system in standby mode for 24 hours followed by alarm mode for 5 minutes. Size battery capacity to allow for a 25 percent growth of the system load while complying with the above requirements.

C. Signaling Line Circuits: Class B, Style 4, signaling line circuit with capacity sufficient for all initiating devices connected to the circuit plus 25 percent spare capacity to allow for future load growth.

D. Notification Appliance Circuits: Class B, Style Y, notification appliance circuit complying with ANSI S3.41 with capacity sufficient for all notification appliances connected to the circuit plus 25 percent spare capacity to allow for future load growth.

E. Control Relays: Provide sufficient addressable control relays to provide accessory functions specified and required by the drawings.

F. Provide TROUBLE ACKNOWLEDGE, DRILL, and ALARM SILENCE switch.

2.03 INITIATING DEVICES

A. Manual Station: Surface mounted, double action addressable manual station.

B. Ceiling Mounted Smoke Detector: Addressable, NFPA 72, photoelectric type [ionization type] with adjustable sensitivity, plug-in base, and visual indication of detector actuation, suitable for mounting on 4-inch outlet box. Suitable for operation on existing control panel power supply and signaling line circuit.

C. Ceiling Mounted Multi-Sensor Detector: Addressable detector with multi-sensor technology to integrate ionization, photoelectric, and heat sensors into one detector. Detector shall have adjustable sensitivity, pre-alarm warning, automatic day/night sensitivity selection, plug-in base, and visual indication of detector actuation, suitable for mounting on 4-inch outlet box.

D. Duct Mounted Smoke Detector: Addressable, NFPA 72, photoelectric type with auxiliary SPDT relay contact, duct sampling tubes extending the width of duct, and visual indication of detector activation, in duct-mounted housing. Provide with remote visual indicator, test, and reset station. Suitable for operation on existing control panel power supply and signaling line circuit.

E. Heat Detector: Addressable combination rate-of-rise and fixed temperature, rated 135° F, and temperature rate of rise of 15° F. Provide hermetically sealed units for use in damp and outdoor locations. Provide fixed temperature devices rated 200° F where indicated.

F. Provide any specialized tools or interface equipment as required to program the addressable devices (i.e. Siemens “Sensor LINK FPI-32”). Turn over one of each type of tool to Owner at completion of project.

2.04 INTELLIGENT MODULES

A. A control relay/transponder shall be installed where building services (i.e. fan shutdown, door holder or release, etc.) are to be automatically controlled by the fire alarm system during a fire emergency. The control relay shall be of a type that only consumes power momentarily while transferring from the deenergized to the energized state or back again. The command to change state shall come from the control panel in accordance with the system program. The control relay shall be condition (deenergized or energized) supervised, and its condition shall be confirmed and corrected, if necessary, during each polling cycle. The control relay/transponder shall be capable of operating on the same communication channel with initiating devices/transponders so that it can be located within 3 feet of the building service device it is controlling as required by NFPA 101-Life Safety Code while its integrity is being monitored from the control panel. The address code of the control relay transponder shall be field selectable and changeable in the same manner as for other transponders. The control relay/ transponder type code shall be factory preset and not be field changeable.

2.05 LINE FAULT ISOLATOR

A. A line fault isolator shall be installed to protect a signaling line circuit from being completely disabled by a short circuit fault. Each signaling line circuit shall have a line fault isolator as every tenth device on the circuit. Only the two line fault isolators with the short circuit fault between them shall respond to the fault condition. When sensing the short the line fault isolators shall disconnect the part of the signaling line circuit between them that includes the short conditioning each remaining part of the circuit to continue to function as a Class B signaling line circuit. Only the transponders located between the 2 line fault isolators shall be disabled, and their failure to respond to the system polling shall be reported as a wiring trouble condition and a list of the addresses of the disabled transponders shall be displayed and recorded at the control panel.

2.06 NOTIFICATION APPLIANCES

A. All appliances shall be U.L. Listed for Fire Protective Service.

B. All appliances shall be of the same manufacturer as the Fire Alarm Control Panel specified to assure absolute compatibility between the appliances and the control panels, and to assure that the application of the appliances is done in accordance with the single manufacturer's instructions.

C. Any appliances that do not meet the above requirements, and are submitted for use must show written proof of their compatibility for the purposes intended. Such proof shall be in the form of documentation from all manufacturers that clearly states that their equipment (as submitted) is 100% compatible with each other for the purposes intended.

D. Fire Alarm Bells: electric vibrating, 10 inch bell with operating mechanism behind dome. Sound Rating: 81dB at 10 feet. Provide weatherproof back box and protective grid on exterior bells.

E. Fire Alarm Strobe Lights: NFPA 72 compliant, surface wall mounted, self-synchronizing, xenon, fire alarm strobe lamp and flasher with flashrate of one flash per second, complying with the requirements of ADAG. Provide red lettered FIRE on clear lens. The strobe shall be field-selectable to provide 15, 30 75, or 110 candela synchronized flash outputs. The settings of all strobes shall be determined by the Contractor during the shop drawing process.

F. Fire Alarm Horn: ANSI S3.41 and NFPA 72 compliant, surface mounted fire alarm horn with adjustable sound output level. Sound Rating: 87 dBA (reverberant) at 10 feet on the "high" setting and 82 dBA (reverberant) at 10 feet on the "low" setting. Provide minimum sound pressure level of 15 dBA above the average ambient sound level in every occupied space within the building. Provide integral fire alarm strobe light as specified above where indicated on the drawings.

G. Fire Alarm Chime and Strobe: ANSI S3.41 and NFPA 72 compliant, surface mounted fire alarm chime with adjustable sound output level. Sound Rating: 70 dBA (reverberant) at 10 feet on the maximum volume setting and 64 dBA (reverberant) at 10 feet on the minimum volume setting. Provide minimum sound pressure level of 15 dBA above the average ambient sound level in areas where mini-horns are used. Provide integral fire alarm strobe light as specified above.

H. Notification appliances shall be listed for use on the existing fire alarm control panel power supply.

I. Digital Alarm Communicator: Provide an electrically supervised, U.L. 864 listed digital alarm communicator to be installed in the fire alarm control cabinet. Communicator shall be capable of transmitting an alarm condition, a trouble condition, a supervisory alarm or a sprinkler system water flow alarm over cellular telephone to a central station receiver. Communicator shall be listed for use with the installed system.

J. Dual Path Communicator: Provide an Internet and GSM communicator complete with power supply, battery back-up, built-in line seizure, and the ability to call a minimum of 8 preprogrammed telephone numbers on a signal from the fire alarm system. Honeywell IPGSM-4G or approved equal.

2.07 AUXILIARY DEVICES

A. NAC Booster Power Supplies:
   1. Power supply quantity, rating and battery size shall be determined by the Contractor. All locations of new power supplies shall be approved by the Owner prior to shop drawing submittal. All new power supplies shall be connected to a dedicated circuit and a handle lock shall be provided on the breaker.

B. Smoke Detector Guard: 16-gauge steel louvered guard with tamperproof fasteners and white baked powder coat enamel finish. Guard shall be specifically UL Listed for use with the

installed smoke detector. Guard shall not affect smoke detector sensitivity or reduce detector spacing. Where surface conduits and backboxes are installed, provide an extension ring with conduit knockout. Extension ring shall be UL listed for use with the installed smoke detector and detector guard. Install guards in process, mechanical, chlorine, electrical and mezzanine areas.

2.08 SPRINKLER PRE-ACTION CONTROL PANEL

A. Control Panel: Microprocessor controlled, single zone panel with modular construction and semi-flush wall-mounted enclosure. Potter #PFC100RC or approved equal.

B. Power Supply: Adequate to serve control panel modules, remote initiating devices, relays, etc. Include battery-operated emergency power supply with capacity for operating system in standby mode for 24 hours followed by alarm mode for 5 minutes.

C. Initiating Device Circuits: Class B, Style B, supervised initiating device circuit.

D. Auxiliary Relays: Provide sufficient SPDT auxiliary relay to provide accessory functions specified.

E. Provide TROUBLE ACKNOWLEDGE, RESET, RELEASING CIRCUIT DISABLE, and ALARM SILENCE switch.

2.09 FIRE ALARM WIRE AND CABLE

A. Fire Alarm System Power Branch Circuits: Building wire as specified in Section 16120.

B. Notification Appliance Circuits: Minimum #12 AWG copper building wire, as specified in Section 16120.

C. Initiating and Signaling Line Circuits: Twisted, shielded or unshielded fire alarm cable as recommended by the fire alarm system manufacturer. Minimum size #16 AWG.

2.10 FIRE ALARM SYSTEM MAP

A. On wall beside each fire alarm panel and text annunciator, provide a system map under clear 1/8” plexiglass with black metal frame permanently screwed to the wall with 4 screws around the perimeter of the map.

B. Map to denote locations of all panels, annunciator, and device address and room numbers that correlate with text display on panel to locate system event.

C. Orientate each map consistent with location the map is installed. Provide call denoting “YOU ARE HERE” at the installation point for each map.

D. The map shall be color-coded for clarity.

E. The final layout to be approved prior to final printing.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install the fire alarm system in accordance with the manufacturer's instructions.

B. Install manual station with operating handle 48 inches above floor. Install notification appliances 80 inches above floor or 6 inches below ceiling, whichever is lower.

C. Install all smoke detectors a minimum of three feet from any air supply, return, or exhaust diffuser and a minimum of one foot from any light fixture.

D. Install all fire alarm system wiring in a dedicated conduit system separate from any other system wiring. Provide minimum 8 inch wire tails at each device box and 50 inch wire tails at the fire alarm control panel.

E. Make conduit and wiring connections to sprinkler water flow switches, sprinkler valve tamper switches, fire suppression control system panels, and other items as shown on the drawings or required by NFPA 72. Note that the sprinkler system is a design build system and not all valve tamper switches and flow switches may be shown on the drawings. The Contractor is responsible to field coordinate all tamper and flow switch locations and connect all switches to the fire alarm system.

F. The Contractor is responsible to field coordinate the final location of all initiating devices and notification appliances to comply with the requirements of NFPA 72. Any initiating devices or notification appliances that are not installed in accordance with NFPA 72 shall be relocated to comply with the requirements of NFPA 72 at no cost to the Owner.

G. Detectors shall not be installed until after the construction clean up of all trades is complete and final. Protective dust covers shall be installed on all detectors prior to final clean-up. Detectors that have been installed without dust covers prior to final clean-up shall be replaced at no cost to the Owner.

H. Field locate remote visual indicators in an accessible location.

I. Where surface mounted devices are used, the Contractor shall install the manufacturer’s approved surface mounting boxes and decorative skirts. The use of standard outlet boxes as specified in Section 16130 is not acceptable.

J. Provide cellular telephone connection of the digital alarm communicator at the discretion of the AHJ.

K. Coordinate with owner to arrange a 24 hour monitoring service for digital alarm communicator via either IP or GSM service that meets the requirements of NFPA 72 and the Authority Having Jurisdiction.

L. Program the system to identify each device with the submitted and approved designation in the LCD annunciators on the control panel.

3.02 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Division 1.

B. Test in accordance with NFPA 72 and local fire department requirements. Provide a completed NFPA 72 Inspection and Testing Form and a copy of the UL 72 certificate for inclusion in the Operation and Maintenance manual at the completion of testing and commissioning the fire alarm system.

C. Provide all equipment, devices and manpower as necessary to test each and every device in the fire alarm system both for function and supervision. Demonstrate that all devices connected to the system function properly.

D. The facility will not be accepted as substantially complete until the fire alarm system has been tested and demonstrated to the Owner's authorized representative as 100 percent complete and fully functional, a completed NFPA 72 Inspection and Testing form is submitted and the paperwork has been filed for the UL Certificated Alarm System.

3.03 MANUFACTURER'S FIELD SERVICES

A. Provide manufacturer's field services under provisions of Division 1.

B. Include services of a certified technician to supervise installation, adjustments, final connections, programming and system testing.

3.04 FIRE ALARM SYSTEM IDENTIFICATION

A. Wire and Cable: Provide fire alarm unit conductors with color coded insulation, or use color coded tape at each conductor termination and in each junction box as follows:
   1. Power Branch Circuit Conductors: Black, red, white.
   2. Initiating Device Circuit: Black, red.
   3. Detector Power Supply: Violet, brown.
   4. Notification Appliance Circuit: Blue (positive), white (negative).

B. Identify all circuit conductors at all terminal and junction boxes per NEC 760.30. Use the circuit designations (i.e. “NAC 1”, “SLC 1”, etc.), as indicated on the shop drawings.

C. Fire Alarm Device Labels:
   1. Install machine-printed device address labels on all addressable devices, including smoke/heat detectors, control relays, monitor modules, etc. Unless otherwise noted, in public spaces where devices are mounted below +80” on walls, install label on inside cover of device. At all other locations, install label on exterior cover of device. Device labels shall show the unique device address corresponding to the text annunciator description. For smoke detectors, the label shall be affixed to the base and not to the detector itself.
   2. Provide label on each remote test station indicating description and location of device being tested.
   3. Provide label on telephone conductors at each end denoting FACP lines for use with the digital alarm communicator transmitter (DACT) telephone dialer if required.

D. The circuit disconnecting means for the fire alarm control panel circuit, remote power booster supply, or other control equipment circuits shall have a painted red handle and handle lock. The circuit(s) shall be labeled “Fire Alarm Circuit”. The circuit assignment and panel location shall be permanently identified on all fire alarm control equipment.

END OF SECTION

SECTION 16755

TELECOMMUNICATIONS RACEWAY AND WIRING SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Requirements for the design and installation of a telecommunications cabling system including communications cable, equipment racks, patch panels, telecommunications jacks, raceways, etc. as required for a complete and functional telecommunications cabling system.

1.02 RELATED SECTIONS

A. Section 16111 - Conduit: Telecommunications raceway system.

B. Section 16130 – Boxes: Outlet boxes for telecommunications system.

C. Section 16190 - Supporting Devices: Supports for conduit and racks.

D. Section 16195 - Identification: Nameplates for equipment racks.

1.03 PROJECT RECORD DOCUMENTS

A. Submit documents under the provisions of Division 1.

B. Accurately record location of jacks, pull boxes and equipment racks, routing of all telecommunications raceways and cables, numbering scheme and identification number of all cables and jacks.

C. Provide AutoCAD drawings of the facility on contract size sheets and on CD showing the following:
   1. On a separate layer show each telecommunication jack location and indicate each jack and cable number by the jack location.
   2. Show all cable counts at all cable junction boxes, sleeves, and J-hook intersections.
   3. On a separate layer show the cable path from the telecommunications equipment room to the end jack location.

D. Submit test results for all cables prior to Substantial Completion.

1.04 WARRANTY

A. A minimum fifteen (15) year manufacturer channel warranty shall be provided. This warranty shall guarantee that the installed system:
   1. Will be free from defects in materials, workmanship and installation labor provided or carried out by the Certified Installer.
   2. Will exceed applicable TIA/EIA and ISO/IEC specifications in force at the time of installation and will comply with design and performance requirements for recognized cabling media installed in the system.
   3. Will support, at a minimum, 1000BaseT, 100Base-TX, 155 Mbps ATM, or any other current or future application that is designed for transmission over a cabling system as defined by the above referenced standards and manufacturers data sheet in effect at the time of the installation.

B. Proof of pre-project warranty registration with manufacturer shall be provided. The Contractor shall also provide proof of manufacturer’s acceptance of warranty after completion of project.

1.05 LISTINGS AND STANDARDS

A. Furnish products listed and classified by Underwriters Laboratories, Inc. and suitable for purpose specified and indicated.

B. Where a UL Standard is in effect equipment shall meet that standard and shall bear the UL label.

1.06 REFERENCE CODES AND STANDARDS

A. The publications listed below form a part of the specification to the extent referenced. The publications are referred to in the text by basic designation only, latest edition. The reference codes and standards are minimum requirements:

1.	ANSI/NFPA 70	2008 National Electrical Code
2.	BICSI	Telecommunications Distributions Methods Manual
3.	TIA/EIA 568-B.1	Commercial Building Telecommunications Cable Standard, Part 1: General Cabling System Requirements
4.	TIA/EIA 568-B.2	Commercial Building Telecommunications Cable Standard, Part 2: Balanced Twisted-Pair Cabling Components
5.	TIA/EIA-568-B.3	Optical Fiber Cabling Components Standard
6.	TIA/EIA 455-61	Measurement of Fiber or Cable Attenuation Using an OTDR
7.	TIA/EIA 569-A	Commercial Building Standard for Telecommunications Pathways and Spaces
8.	TIA/EIA 606-A	Administration Standards for the Telecommunications Infrastructure of Commercial Buildings
9.	TIA/EIA 607-A	Commercial Building Grounding and Bonding Requirements for Telecommunications

1.07 QUALITY ASSURANCE

A. [Telephone Utility Company: [_____]]

B. Install telephone service entrance in accordance with Telephone Utility Company's Rules and regulations.

C. Install all work in accordance with the above reference standards and codes. The Owner reserves the right to reject all or a portion of the work performed either on technical or aesthetic grounds.

D. All telecommunications cabling system layout and installation shall be overseen by a BICSI-certified Registered Communications Distribution Designer (RCDD). The installer shall either have an RCDD on permanent staff or shall have an RCDD on contract for the duration of the project. The RCDD shall sign and attest to all cable distribution design submittals and project record drawings and shall attest to the completeness and accuracy of the system layout and installation.

E. All workmen employed for installation of equipment and cabling specified under this section shall be specifically trained and certified in the installation of the specified Category 5e UTP and fiber optic cabling systems, and shall have at least three years experience installing, terminating, and testing Category 5e UTP and fiber optic cable on this size and complexity of project.

F. The intended function of the telecommunications cable system is to transmit voice and data signals from a central location to individual telecommunications outlet locations. Upon completion of the work, the UTP cable system shall be capable of transmitting a data signal that meets and exceeds the requirements of Category 5e and supports data rates up to and

including 1000BaseT, 1000Base-TX, and 155 Mbps ATM. The multimode fiber optic cable system shall be capable of transmitting signals with a minimum bandwidth of 160MHz at 850 nm and 500 Mhz at 1300 nm. The loss of each strand of fiber shall not exceed 3.0/1.0 dB per kilometer at 850/1300 nm and the loss of each connector shall not exceed .2 dB.

1.08 SUBMITTALS

A. Submit product data under provisions of Division 1. Provide factory test results for cables and connectors. Provide product data for the following products:
   1. Telecommunications rack and associated rack hardware
   2. UTP and Fiber Telecommunications Cable
   3. UTP Telecommunications Jacks and Faceplates
   4. Fiber Connectors
   5. UTP Modular Patch Panel
   6. Fiber Connector Housings and Panels
   7. UTP and Fiber Patch Cables
   8. Cable Management Panels
   9. UTP and Fiber Telecommunications Cable Tester
   10. UTP and Fiber Sample Test Report (with all required testing parameters shown).

B. Submit certification for RCDD.

C. Submit qualifications and certifications to install the specified cabling system, including proof of pre-project warranty registration.

D. Submit scaled drawings showing the locations of all telecommunications jacks, equipment racks, telecommunications pullboxes, raceway and cable routing, and all penetrations of fire-rated walls and ceilings. Drawings shall show jack labels and cable counts. Submit elevations of each equipment rack. Provide a complete schedule of all telecommunications jacks with their jack numbers and associated cable number. Shop drawings shall be approved prior to installation of any portion of the telecommunications system. Electronic AutoCAD® drawings of the facility are available upon request for preparation of the shop drawings.

1.09 LABELING SYSTEM

A. Labeling shall conform to ANSI/TIA/EIA-606 standards. In addition, provide the following:
   1. Labels on all outlets shall have minimum 3/16-in. high characters and shall be installed behind recessed clear plastic covers on faceplate.
   2. Provide labels on face of data patch panels and on inside cover of fiber connector housings. Provide facility assignment records in a protective cover at the telecommunications rack.
   3. Labels shall be machine-printed. Hand-lettered labels are not acceptable.
   4. Label outlets with room number in which outlet is located (xxx), followed by a single number to indicate the particular outlet within the room (Jx). Example: 161-J2.
   5. Label patch panels with room number in which outlet is located (xxx), followed by a single number to indicate the particular outlet within the room (Jx), followed by a single number to indicate the particular connector in the outlet. Example: 161-J2-3.
   6. Label telecommunications racks with telecom room designation (TRx), followed by the rack designation in the closet (Rx). For example, in Telecommunications Room 1, racks 1 and 2 would be labeled: TR1-R1 and TR1-R2.
   7. Label fiber connector housings with rack designation at both ends of the backbone cable. Example: TR1-R1 – TR6-R2.
   8. Provide computer-generated Project Record Drawing drawings showing outlet locations, type, and designation. Turn these drawings over to the Owner's Representative two (2)

weeks prior to substantial completion, to allow the Owner's Personnel to connect and test Owner-provided equipment in a timely fashion.

9. Provide telecommunications outlet list, one-line diagram and as-built building floor plan of outlets associated with the specific telecom closet where the outlets are terminated. In each telecom closet, mount list and plans on backer board with minimum 1/8 inch clear Plexiglas cover screwed to wall on four corners. Provide list and plans electronically in AutoCAD format, submitted with the O&M manuals.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Throughout this specification, specific manufacturers and manufacturer's catalog numbers are cited. These citations are for the purpose of establishing quality and performance criteria and are not intended to be proprietary. All products in the structured cabling system shall be provided from one of the three approved systems listed in each section, or an alternate system shall be substituted under the provisions of Division 1. All decisions regarding approval of non-specified manufacturers and products will be at the discretion of the Owner.

B. Structured Category 5e cabling systems shall include, but not be limited to, UTP and fiber telecommunications cable, UTP jacks, faceplates, modular patch panels, fiber connector panels, and UTP and fiber patch cables.

2.02 TELECOMMUNICATIONS BACKBOARD

A. Material: ACX Plywood.

B. Size: As indicated, ¾" thick.

C. Wall-mounted, solid copper, 12 inch by 4 inch by ¼ inch thick busbar with two insulators and standoff brackets. Chatsworth #40153-012 or approved equal.

D. Cable Support: Provide cable management rings and cable support straps for all cables routed on backboard.

E. Wall-mounted equipment rack, as specified below.

2.03 TELEPHONE PUNCHDOWN BLOCKS

A. Wall-mounted type 66 block for cross-connect with incoming telephone utility cable: 50-pair capacity with cable management.
   1. Siemon S66B3-50 with S20A cable management

B. Wall-mounted type 110 wiring block with 100-pair capacity and standoff legs for cross-connect of intra-building telephone backbone cables. Use 5-pair connecting blocks.
   1. CommScope Systimax #110AW2-100
   2. Ortronics #OR-30200145
   3. Leviton #41AW2-100

2.04 TELECOMMUNICATIONS EQUIPMENT RACKS

A. Floor Racks: Chatsworth #46353-503 or approved equal, seven-foot high, self-supporting, floor mounted, pre-drilled and tapped, 19 inch, aluminum EIA equipment rack with clear finish. The floor rack shall have the following features:
   1. One Chatsworth #12096-503 or approved equal double-sided narrow vertical rack cabling section with clear finish on each side of the rack.
   2. One Chatsworth #10250-112 or approved equal steel cable runway with 12" wide cross members welded at 12" intervals and gray finish. Provide cable runway from telecommunications rack(s) to wall as indicated on the Drawings. Provide Chatsworth

#11421-112 or approved equal wall angle support kit and Chatsworth #10595-112 or approved equal rack-to-runway mounting plate for cable runway.

3. Provide Chatsworth #10562-001 or approved equal universal earthquake bracing kit, along with all associated hardware required to seismically brace racks to wall.
4. One Chatsworth #40108-519 or approved equal double-sided aluminum shelf with clear finish, capable of supporting 50 pounds per side. Mount shelf at base of rack for network server, as shown on the Drawings.
5. One Chatsworth #11245-519 or approved equal adjustable aluminum monitor shelf with clear finish, capable of supporting 110 pounds. Mount shelf in top half of rack for monitor, as shown on the Drawings.
6. One Chatsworth #12193-501 or approved equal 19" aluminum sliding keyboard and mouse tray with clear finish, capable of holding a full-size keyboard. Mouse tray shall be mounted at the front right corner of the keyboard tray and shall slide forward.
7. One Chatsworth #40074-500 or approved equal single-sided aluminum shelf with clear finish, capable of supporting 50 pounds. Mount shelf as shown on the Drawings.
8. One Chatsworth #10610-019 or approved equal 3/16" x 3/4" rack-mounted copper grounding bar with 6 tapped ground mounting holes. Mount the grounding bar at the top of the equipment rack.
9. One Leviton #5500-192 or approved equal 20-Amp rack-mounted surge protective outlet strip with five rear-mounted duplex outlets, one front-mounted duplex outlet, On/Off switch, 12-foot cord, and black housing. Outlet strip shall have normal/common mode ratings of 33,000/26,000 mA peak, 50-60 dB. Mount outlet strip at base of rack, as shown on the Drawings.

B. Wall Racks: Chatsworth #11348-519 or approved equal, 35-inch high, 18-inch deep, side-hinged aluminum wall rack with dual locking latches, 20 rack-mount units of usable space, clear finish, and vertical cable management on hinge side of rack. The wall rack shall be capable of supporting 150 pounds and shall open to 180 degrees. The wall rack shall have the following features:
   1. One Ortronics #60400010 or approved equal rack-mounted grounding kit, mounted on the equipment rack, as shown on the Drawings.
   2. One Leviton #5500-192 or approved equal 20-Amp rack-mounted surge protective outlet strip with five rear-mounted duplex outlets, one front-mounted duplex outlet, On/Off switch, 12-foot cord, and black housing. Mount outlet strip at base of rack, as shown on the Drawings.
   3. Wall rack shall be mounted on ¾" ACX plywood backboard, 30-inches wide by 48-inches high.

C. Hinged wall-mount equipment brackets shall provide standard 19 inch EIA mounting space and shall be 6 inches deep and hinged on one side. Provide number of brackets [as indicated on the drawings or] as required to mount all patch panels and wire management panels. Ortronics #OR-604004645 or approved equal. Racks shall be secured to a wall-mounted ¾" thick ACX plywood backboard, sized as shown on the drawings and painted white.

2.05 UTP TELECOMMUNICATIONS CABLE

A. Unless otherwise noted on the drawings provide and install plenum-rated CL2P [riser-rated CL2], as noted on the drawings and as required by the space the cable is passing through, Category 5e, 4 pair, 24 AWG, solid copper conductor telecommunications cable from each telecommunications jack to the corresponding patch panel.
   1. CommScope Systimax #2061 [1061]
   2. Berk-Tek "LANmark 350" CMP [CMR]
   3. Superior Essex "Cobra" #52-241 [52-240]

2.06 UTP TELECOMMUNICATIONS JACKS

A. All UTP telecommunications jacks shall be type RJ-45, Category 5e, T568A/B, 8P8C, single, white finish, telecommunications jack with 45° exit for wall outlets and flush exit for outlets in horizontal dual-channel surface raceway. Unless otherwise noted on the drawings, install each telecommunications jack in a single gang faceplate at each telecommunications outlet. The quantity of faceplate openings shall match the quantity of jacks at each location. The Contractor shall verify the actual wiring configuration (T568A or 568B) with the Owner prior to submittal.

B. UTP Jacks:
   1. CommScope Systimax #MPS100E-246 for T568A/B wiring
   2. Ortronics “TracJack Clarity 5e” #OR-TJ5E00 for T568A/B wiring
   3. Leviton “GigaMax 5e+” #5G110-RW5 for T568A/B wiring

2.07 TELECOMMUNICATIONS OUTLET FACEPLATES

A. Unless otherwise noted, all faceplates shall be single-gang plastic faceplates with white finish. The number of openings in each faceplate shall match the jack count of each outlet shown on the Drawings. (x in part numbers = designation for number of openings in faceplate).

B. Faceplates For Wall Outlets:
   1. CommScope Systimax #M1xL-246
   2. Ortronics “TracJack” #OR-4030054x
   3. Leviton #41080-xWP

C. Faceplates For Horizontal Dual-Channel Surface Raceway:
   1. CommScope Systimax: Same as for wall outlets.
   2. Ortronics: Same as for wall outlets.
   3. Leviton: Same for wall outlets.

2.08 FACEPLATE ICONS

A. Color coded icons shall be provided to distinguish between designated telephone and data outlets in all faceplates as follows:

B. Designated telephone outlets in workstation faceplates: Red “telephone” icon.
   1. CommScope Systimax #L2300-RD
   2. Ortronics #OR40322100
   3. Leviton: No icon available. Use red telecom jack.

C. Designated telephone outlets in workstation faceplates: Blue “data” icon.
   1. CommScope Systimax #L2300-BL
   2. Ortronics #OR40326200
   3. Leviton: No icon available. Use blue telecom jack.

2.09 UTP MODULAR PATCH PANEL

A. Provide and install high-density 48 port, Category 5e, modular patch panels in each equipment rack. The front of the patch panels shall be equipped with RJ-45, T568A/B, 8P8C Category 5e compliant jacks (and integral wire management rings for CommScope patch panels). The jacks shall be factory wired to a 110 type IDC connector. The complete assembly shall exceed the requirements of TIA/EIA 568-B (Category 5e), and be factory tested to 1000 Mbps data rates. Install the number of patch panels in each equipment rack as shown on the drawings or as required to terminate all UTP cables at the rack plus 25% spare capacity. The Contractor shall verify the actual wiring configuration (T568A or 568B) with the Owner prior to submittal.
   1. CommScope Systimax “Patchmax” #PM2150PSE-48 for T568A/B wiring.
   2. Ortronics “Clarity5e” #OR-PHD5E6U48 for T568A/B wiring.

3. Leviton “GigaMax” #5G596-U48 for T568A/B wiring.

2.10 UTP CABLE MANAGEMENT PANELS

A. Horizontal cable management panels shall have five metal horizontal cable rings. For the Berk-Tek/Ortronics and Leviton structured cabling systems, install cable management panels in the equipment rack. Unless otherwise noted on the drawings, install one cable management panel between each patch panel and below the last patch panel.
   1. CommScope Systimax - Integral to patch panel.
   2. Ortronics #OR-60400057
   3. Leviton #4925C-BCM

B. Vertical cable management panels shall have four horizontal cable rings and four vertical cable rings. Panels shall be installed in wall-mounted telecommunications racks, as shown on the Drawings.
   1. CommScope Systimax #1100D1-35-19
   2. Ortronics #OR-808004410
   3. Leviton: Not available. Use one of the products above.

2.11 UTP PATCH CABLES

A. All patch cables shall be factory manufactured to match the applicable cable/connectivity solution (i.e. the Berk-Tek/Ortronics system shall use Ortronics manufactured patch cords, etc.).

B. Telephone Cross-Connect: Provide 7-foot Category 5e patch cables with white or ivory jacket for cross-connect between the telephone patch panel and the telecommunications patch panels. Provide one patch cable for each port in all the telephone patch panels.
   1. CommScope Systimax #CPC6642-05F007
   2. Ortronics #OR-MC5E07-09
   3. Leviton #5D460-07W

C. Network Equipment Connections: Provide Category 5e patch cables with blue jacket for installation between network equipment in the rack and dedicated data ports in the telecommunications patch panels. Provide one patch cable for each port in all the telecommunications patch panels. Where the patch panels and switches are in the same rack, provide 7’ cables. Where the patch panels and switches are in different racks, provide 15’ (14’ for CommScope) cables. (xx in part numbers = cable length)
   1. CommScope Systimax #CPC6642-02F0xx
   2. Ortronics #OR-MC5Exx-06
   3. Leviton #5D460-xxB

D. VoIP Connections: Provide 7-foot Category 5e patch cables with yellow jacket for cross-connect between the VoIP switch ports and the telecommunications patch panels. Provide ___ patch cables for each 48-port patch panel installed.
   1. CommScope Systimax #CPC6642-09F007
   2. Ortronics #OR-MC5E07-04
   3. Leviton #5D460-07Y

E. Wireless Access Point Connections: Provide [plenum-rated] 7-foot Category 5e patch cables with white or ivory jacket for connection to wireless access points. Provide one patch cable for each access point location shown on the Drawings.
   1. CommScope Systimax #CPC6642-05F007
   2. Ortronics #OR-MC5E07-09
   3. Leviton #5D460-07W

F. Computer Connections: Provide 10-foot (9-foot for Ortronics) long Category 5e patch cable with white or ivory jacket for installation between the data jacks in each telecommunications outlet

and the Owner-provided computers. Provide one patch cable for each data jack in all the telecommunications outlets, plus 25% additional cables for future expansion or replacement cables.

1. CommScope Systimax #CPC6642-05F010
2. Ortronics #OR-MC5E09-09
3. Leviton #5D460-10W

2.12 VOICE BACKBONE CABLE

A. Unless otherwise noted on the drawings provide and install plenum-rated CL2P [riser-rated CL2], as noted on the drawings and as required by the space the cable is passing through, Category 3, 24 AWG, solid copper conductor multi-pair telephone backbone cable. (xx in part numbers = pair count, as shown on Drawings)

1. CommScope Systimax #10100xxAGY
2. Berk-Tek #230xxx
3. Superior Essex #18-xxx-46

2.13 FIBER OPTIC BACKBONE CABLE

A. All multimode fiber optic cables that stay within the building envelope shall be UL listed, plenum-rated, tight buffered, 62.5/125 micron, multimode, FDDI indoor fiber optic cable meeting National Electrical Code plenum (OFNP) standards. Cables shall have a flame-resistant PVC outer jacket and operate in a range from -20°C to 70°C. (xx in part numbers = fiber count, as shown on Drawings)

1. CommScope Systimax “OptiSPEED” #ABC-0xxD-LPX
2. Berk-Tek #PDP0xx-CB3510/25
3. Superior Essex #440xxx6G01

B. All multimode fiber optic cables that stay within the building envelope and are installed in conduits shall be UL listed, riser-rated, tight buffered, 62.5/125 micron, multimode, FDDI indoor fiber optic cable meeting National Electrical Code riser (OFNR) standards. Cables shall have a flame-resistant PVC outer jacket and operate in a range from -20°C to 70°C. (xx in part numbers = fiber count, as shown on Drawings)

1. CommScope Systimax “OptiSPEED” #ABC-0xxD-LRX
2. Berk-Tek #PDR0xx-GB3510/25
3. Superior Essex #430xxx6G01

C. All multimode fiber optic backbone cables that exit the building envelope shall be UL listed, plenum-rated, loose tube, 62.5/125 micron, multimode, FDDI, indoor/outdoor, fiber optic cable meeting National Electrical Code plenum (OFNP) standards. The cable shall utilize dry water-blocking technology, have a UV-stabilized, flame-resistant PVC outer jacket, and operate in a range from -40°C to 70°C. (xx in part numbers = fiber count, as shown on Drawings)

1. CommScope Systimax “Option1” #AT-RU912O6-0xx
2. Berk-Tek “Adventum” #LTP0xx-CB3510/25
3. Corning Cable Systems “FREEDM/LST” #0xx-KSF-14130A20

2.14 FIBER CONNECTORS

A. All fibers shall be terminated with SC [ST] [MTRJ] type connectors with ceramic ferrule. The termination method shall be a mechanical crimp an adhesive (3M Hotmelt, Avaya Anaerobic, Corning Cable Anaerobic) system.

1. CommScope Systimax #P6201A-Z-126
2. Corning Cable Systems “Unicam” #95-000-40
3. Leviton “FastCAM SC” #49991-MSC

2.15 FIBER CONNECTOR PANELS

A. All fiber connector panels shall have three duplex SC fiber adapters with ceramic sleeve and fiber designation strip.
   1. CommScope Systimax #12SC1-Duplex-EW
   2. Ortronics #OR-615SCDSM3C-L
   3. Leviton “Opt-X” #SF100-3SC

2.16 FIBER CONNECTOR HOUSINGS

A. Single-drawer housing with space for horizontally mounted connector panels to terminate up to 24 fibers. Housing shall have slide-out drawer with label sheet, smoked shatterproof polycarbonate door with latch, and deep front shelf area to provide adequate strain relief for cables.
   1. CommScope Systimax #600B2
   2. Ortronics #OR-615MMC-36P-00
   3. Leviton “Opt-X” #5R460-00N

2.17 FIBER STORAGE RING

A. Leviton #48900-IFR or approved equal 12-inch diameter inside plant fiber storage ring with Velcro retaining loops. Provide one storage ring in each closet, adjacent to the rack where the fiber cables are terminated.

2.18 FIBER PATCH CORDS

A. All multimode fiber optic patch cords shall be UL listed, 62.5/125 micron, multimode, 3-meter (10-foot) long, fiber cords with flame-resistant PVC outer jacket. Cables shall have duplex SC [ST] [MTRJ] type connectors with ceramic ferrule. Patch cords shall be factory terminated and tested to 1000 Mbps data rates. Include copy of factory test report with submittal.
   1. CommScope Systimax #FL2SC-SC-10
   2. Ortronics #OR-61150D62003M99C
   3. Leviton #62DSC-M03

2.19 CABLE SUPPORT

A. All cables not installed in conduit shall be supported using J-hooks, Caddy CableCat series or approved equal, with a minimum J-hook size equivalent to Caddy #Cat32 or approved equal. Size all J-hooks to support the quantity of cables installed, plus a minimum of 25% spare capacity. Fiber optic cables shall be routed in 1” innerduct that is supported on a separate J-hook above the J-hook supporting the copper cables.

B. Cables shall be bundled using Velcro “One-Wrap” or approved equal reusable straps with a minimum ¾ inch width. Plastic tie-wraps or cinch-straps are not allowed.

2.20 EXTRA MATERIALS

A. Furnish to the owner the following spares parts:
   1. Five (5) percent of each type of UTP telecommunications jack.
   2. Five (5) percent of each type of telecommunications faceplate.
   3. Identification icons: Provide two spare bags (25 icons per bag) each of telephone and data icons.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work.

3.02 GENERAL INSTALLATION

A. Incoming outside plant telephone cable shall be terminated on punchdown blocks located on the telecommunications backboard. One or more multi-pair cables shall be routed from the cross-connect blocks to the telephone patch panel in the telecommunications rack. Patch cords shall be used between the telephone and telecommunications patch panels to connect a telephone line to a specific jack in the building.

B. Follow cable manufacturer's specification regarding handling methods, retaining/support methods, bending radius and maximum pulling tension limitations. Where manufacturer does not provide bending radius information, minimum bending radius shall be 10 times the diameter of the cable. Use a tension-monitoring device to ensure that the maximum pulling tension that may be applied to the cable to be pulled into a conduit section is not exceeded. Provide replacement cable if cable manufacturer's maximum pulling tension is exceeded at any time during a pull.

C. Cable shall be carefully inspected for sheath defects or other irregularities as it is paid out from the reel. When defects are detected, pulling shall stop immediately and the cable section shall be repaired or replaced at the discretion of the Contracting Agency. A system of communications shall be maintained between pulling and feed locations so that pulling can be stopped instantly, when required.

D. Adequate care shall be exercised when handling and storing reels of cable to prevent damage to the cable. Cable with dents, flat spots, or other sheath distortions shall not be installed.

E. Install termination backboards plumb, and attach securely at each corner.

F. Store a maximum of one foot of slack UTP cable for each UTP jack at each telecommunications outlet.

G. In the telecommunications closet, ten feet of slack UTP cable shall be provided at the racks. Route the service loop around the cable runway above the racks. No cables shall encroach or interfere with rack equipment space. All cables shall be protected from physical damage and should not be routed on the floor. Coiling the slack cable adjacent to the rack is not acceptable. The intent of this installation method is to provide slack cable for future work without causing increased inductance by coiling the cables.

H. In the telecommunications closet, a twenty-foot service loop for each fiber cable shall be provided on the fiber storage ring adjacent to the rack. All incoming fiber cables shall be stored on this ring to maintain the minimum bending radius of the fiber cable.

I. All cabling shall be run continuous with no splices from each telecommunications jack to the cable connector at the patch panels. Telecommunications cables shall be terminated at each end on their respective jack. No cable run shall exceed 90 meters (295 feet) in length from the jack on the peripheral end to the patch panel.

J. All fiber optic cables shall be run continuous with no splices from rack to rack.

K. All cable shall be routed in such a way as to minimize EMI and RFI interference. Cables shall be routed to maintain the following minimum distances from noise producing devices:

5 inches from power lines of 2 kVA or less.

12 inches from fluorescent and HID ballasts

36 inches from 5 kVA or greater power lines

40 inches from transformers and motors

3.03 TERMINATIONS

A. The jacket of UTP cables shall be maintained to a point within one half inch of the telecommunications jack. The twists on the individual pairs shall be maintained as close as possible to the contacts of the termination points but shall in no case exceed 1/4 inch.

B. Pairs from each cable shall be terminated sequentially from left to right, top to bottom starting with the lowest assigned number at the upper left-hand corner of the panel.

C. Fibers shall be terminated sequentially from left to right in connector housing, based on standard color code sequence of individual fiber coatings.

3.04 PATHWAYS AND RACEWAYS

A. Unless otherwise noted, all cables shall be installed in [conduit] [surface raceways] from the telecommunications jack to the [equipment rack.] [space above the accessible ceiling, within 18" of the [J-hook] [cable tray] pathway. Portions of cables not installed in conduit shall be supported in accordance with TIA/EIA standards at intervals not exceeding four (4) feet in length using J-hooks. The cable shall not be supported from ducts, pipes, conduits, ceiling grid hangar wires, etc. At any point where the cable changes direction, slack shall be provided to prevent rubbing or binding on the corner supports.] Extreme care shall be taken to ensure that the cable is not compressed, kinked or otherwise deformed during installation. Any cable that is stretched, compressed, kinked or otherwise deformed shall be replaced at no cost to the Owner.

B. Cables to be installed in raceway, cable tray, continuous cable support system or J-hooks (as specified above) for the entire length of each cable. Provide raceway through areas that will not be accessible for future cable replacement or additions.

C. Provide pathway capacity throughout entire system for each telecommunication outlet served, sized to accommodate a minimum of four 4-pair cables from each outlet location to the designated telecommunication room, as shown on the plans.

D. Telecommunication cables shall not be installed in the same raceway or pathway as power cables.

E. Provide dedicated optical fiber raceway pathway for all optical fiber cable.

F. Install polyethylene pulling string in each empty conduit containing a bend or over 10 feet in length.

G. Install all telecommunications outlets in outlet boxes under the provisions of Section 16130. Unless otherwise noted on the Drawings or in the Specifications, outlets shall be mounted at 18 inches above floor, 4 inches above counters or backsplash, with the jacks oriented in the standard "pins down" position.

H. Support raceways, cable tray, outlet boxes, junction boxes and equipment racks under the provisions of Section 16190.

3.05 LABELING

A. Label equipment racks as noted here-in and under the provisions of Section 16195.

B. Furnish and install labels and documentation to identify all cables, jacks, and connections in accordance with TIA/EIA standards, as shown on the Drawings, and under the provisions of Section 16195. As a minimum each jack in each faceplate shall have a unique identifier that matches the identifier at the patch panel. Identifiers shall be installed on the front of the telecommunications faceplate, on the cable behind the faceplate, and on the front of the patch panel at the associated jack.

3.06 GROUNDING

A. Provide and install [as indicated on the Drawings.] [a #2 AWG, copper telecommunications bonding backbone (TBB) conductor from the grounding lug at the equipment rack to the ground bus in the main switchboard.]

B. The TBB shall be routed along the telecom backbone pathway. In areas above accessible ceilings, the TBB conductor may be routed exposed. In inaccessible areas, the TBB conductor shall be routed in conduit and shall be bonded at both ends. All grounding and bonding shall be done in accordance with TIA/EIA standards.

3.07 CABLE ACCEPTANCE TESTING

A. Prior to any cable testing, use the rack-mounted LAN static discharge unit to remove static charges from all cables. Cable testers with built-in static discharge capability are also acceptable.

B. Each UTP cable shall be tested for compliance with TIA/EIA 568-B.1 and TIA/EIA 568B.2 Category 5e standards after installation using a Fluke #DTX or approved equal tester. At a minimum, the Contractor shall perform the following tests with the maximum frequency of the tester set at 350MHz:
   1. Signal Attenuation / Insertion Loss
   2. Near End Cross Talk (NEXT)
   3. Power Sum Near End Cross Talk (PS-NEXT)
   4. Equal Level Far End Cross Talk (ELFEXT)
   5. Power Sum Equal Level Far End Cross Talk (PS-ELFEXT)
   6. Attenuation to Crosstalk Ratio (ACR)
   7. Power Sum Attenuation to Crosstalk Ratio – Near End (PSACR-N)
   8. Power Sum Attenuation to Crosstalk Ratio – Far End (PSACR-F)
   9. Propagation Delay
   10. Delay Skew
   11. Return Loss
   12. Wiremap
   13. Overall Cable Length

C. Test, analyze, and record compliance for the following network protocols:
   1. 10 Base-T
   2. 100 Base-T
   3. 1000 Base-T
   4. 155 Mbps ATM

D. The Contractor shall provide 100% testing for each “permanent link” (i.e. from the work area outlet to the patch panel). Provide test results for all tests noted above in the form of printouts from the test equipment and provide an electronic copy of the test data for each cable on CD. If proprietary software is used, the submitted CD shall include any necessary software required to view test results. If the results are delivered in a standard format such as Excel or Access, the viewing software need not be provided. At the front of the test report, the Contractor shall provide an index showing the pass/fail results of each cable, along with the cable length and a corresponding cable label.

E. Initially test each fiber optic cable with a light source and power meter, utilizing procedures as stated in TIA/EIA-526-14A: OFSTP-14A Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant and TIA/EIA-526-7 (currently Standard Proposal Number 2974-B). Field test instruments for singlemode fiber cabling shall meet the requirements of TIA/EIA-526-7. Measured results shall be plus/minus 1dB of submitted loss budget calculations. If loss figures are outside this range, test cable with an Optical Time Domain Reflectometer (OTDR) in

accordance with TIA/EIA 455-61 to determine the cause of variation. Improper terminations shall be re-done and damaged cable shall be replaced at no additional cost to the Owner. The maximum acceptable signal loss through the entire fiber path, including cable, couplings, and jumpers shall not exceed TIA/EIA 568-B.3 standards. Test each multimode cable in both directions for signal attenuation at 850 and 1300 nm, using “Method B” – One jumper reference.

F. Where any portion of the system does not meet the Specifications, the Contractor shall correct the deviation and repeat any applicable testing at no additional cost to the Owner.

G. Provide three working days advance notice of tests. The Owner’s Representative shall reserve the right to be present during the testing of any or all cables in the system. Submit a copy of the test report for each cable prior to substantial completion of the project.

H. Acceptance of the telecommunications system shall be based on the results of the above tests, functionality, and the receipt of documentation.

I. Prior to Substantial Completion, submit the measured values for the telecommunications rack AC ground resistance and the voltage at the dedicated plug strip on the telecommunications rack.

3.08 SYSTEM CROSS-CONNECT

A. Provide all labor and materials as required to cross-connect between the installed telecommunications cabling system and the Owner’s telephone and computer systems. This shall include the following:
   1. Telephone System: Provide cross-connect between Owner’s telephone switch and the telephone punchdown blocks or patch panel. The intent is to connect the Owner’s telephone system to the installed telecommunications cabling system so that designated ports throughout the facility can be activated as telephone lines with dial tone capability. All telephone system programming required for this function shall be provided by the Owner under separate Contract. For bidding purposes, assume a 50-pair cross-connect but coordinate with the Owner for the exact requirements prior to installation.
   2. Network System: Provide cross-connect between Owner’s network switches and the installed fiber patch panels and horizontal patch panels. The intent is to assist the Owner in activating designated computer ports throughout the facility. All network programming required for this function shall be provided by the Owner under separate Contract. For bidding purposes, assume a total of 50 cross-connections between the network cabling system and the active equipment.

END OF SECTION

SECTION 16755

TELECOMMUNICATIONS RACEWAY AND WIRING SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Requirements for the design and installation of a complete and functional telecommunications cabling system including communications cable, equipment racks, patch panels, telecommunications jacks, raceways, and other equipment or components as required to achieve the specified function.

1.02 RELATED SECTIONS

A. Section 16130 – Boxes.

B. Section 16190 - Supporting Devices.

C. Section 16195 – Electrical Identification.

1.03 PROJECT RECORD DOCUMENTS

A. Submit documents under the provisions of Division 1.

B. Accurately record location of jacks, pull boxes and equipment racks, routing of all telecommunications raceways and cables, numbering scheme and identification number of all cables and jacks.

C. Provide AutoCAD drawings of the facility on contract size sheets and on CD showing the following:
   1. On a separate layer show each telecommunication jack location and indicate each jack and cable number by the jack location.
   2. Show all cable counts at all cable junction boxes, sleeves, and J-hook intersections.
   3. On a separate layer show the cable path from the telecommunications equipment room to the end jack location.

D. Submit test results for all cables prior to Substantial Completion.

1.04 LISTINGS AND STANDARDS

A. Furnish products listed and classified by Underwriters Laboratories, Inc. or other OSHA NRTL and suitable for purpose specified and indicated.

B. Where a UL Standard is in effect equipment shall meet that standard and shall bear the UL label.

1.05 REFERENCE CODES AND STANDARDS

A. The publications listed below form a part of the specification to the extent referenced. The publications are referred to in the text by basic designation only. The reference codes and standards are minimum requirements:

1.	ANSI/NFPA 70	National Electrical Code, latest adopted version.
2.	BICSI	Telecommunications Distributions Methods Manual, current version.
3.	TIA/EIA 568-C	Commercial Building Telecommunications Cable Standard, current version.
4.	TIA/EIA 569-C	Commercial Building Standard for Telecommunications Pathways and Spaces, current version
5.	TIA/EIA 606-A	Administration Standards for the Telecommunications Infrastructure of Commercial Buildings, current version.

6. J-STD-607-A Commercial Building Grounding and Bonding Requirements for Telecommunications, current version.

1.06 QUALITY ASSURANCE

A. Install voice over internet protocol telephone service equipment in accordance with NEC Article 800 requirements.

B. Install all work in accordance with the above reference standards and codes. The Owner reserves the right to reject all or a portion of the work performed either on technical or aesthetic grounds.

C. All telecommunications cabling system layout and installation shall be overseen by a BICSI-certified Registered Communications Distribution Designer (RCDD). The installer shall either have an RCDD on permanent staff or shall have an RCDD on contract for the duration of the project. The RCDD shall sign and attest to all cable distribution design submittals and project record drawings and shall attest to the completeness and accuracy of the system layout and installation.

D. All workmen employed for installation of equipment and cabling specified under this section shall be specifically trained and certified in the installation of the specified Category 6 UTP cabling systems, and shall have at least three years experience installing, terminating, and testing Category 6 UTP on this size and complexity of project.

E. The intended function of the telecommunications cable system is to transmit voice and data signals from a central location to individual telecommunications outlet locations. Upon completion of the work, the UTP cable system shall be capable of transmitting a data signal that meets and exceeds the following requirements:
   1. Category 6: Supports data rates up to and including 1 Gb/s.

1.07 SUBMITTALS

A. Submit product data under provisions of Division 1. Provide factory test results for cables and connectors. Provide product data for the following products:
   1. Telecommunications rack and associated rack hardware
   2. UTP Telecommunications Cable
   3. UTP Telecommunications Jacks and Faceplates
   4. UTP Modular Patch Panel
   5. UTP Patch Cables
   6. Cable Management Panels
   7. UTP Telecommunications Cable Tester
   8. UTP Sample Test Report (with all required testing parameters shown).

B. Submit certification for RCDD.

C. Submit qualifications and certifications to install the specified cabling system.

D. Submit scaled drawings showing the locations of all telecommunications jacks, equipment racks, telecommunications pullboxes, raceway and cable routing, and all penetrations of fire-rated walls and ceilings. Drawings shall show jack labels and cable counts. Submit elevations of each equipment rack. Provide a complete schedule of all telecommunications jacks with their jack numbers and associated cable number. Shop drawings shall be approved prior to installation of any portion of the telecommunications system. Electronic AutoCAD® drawings of the facility are available upon request for preparation of the shop drawings.

1.08 LABELING SYSTEM

A. Labeling shall conform to ANSI/TIA/EIA-606 standards, Section 16075, and this Section.

B. Telecommunications Outlets:
   1. Labels on all outlets shall have minimum 1/8-in. high characters and shall be installed behind recessed clear plastic covers on faceplate.
   2. Label room outlets with two labels on the faceplate as follows:
      a. Top Label: Shows the telecommunication room the cable is run to (TR1, TR2, etc), followed by rack number (1, 2, etc.) followed by patch panel identification expressed as a letter (A), followed by port in patch panel the outlet is located (xx). Example: TR1-2B:38 (where TR1 indicates closet, 2 is the second rack, B is the second patch panel in the rack, 38 is the port in patch panel).
      b. Bottom Label: Shows the room number (room 103), followed by the jack/outlet number (J2) from the left when entering the room, followed by the quantity of ports within the outlet faceplate (1-6). Example: 103 J2:1 (where 103 is the room number, J2 is the 2nd jack/outlet from the left in the room, and 1 is the single port in the faceplate). Where the faceplate has multiple ports, the last part of the ID shall indicate the quantity. Example: 103 J2:1-4 (where 103 is the room number, J2 is the 2nd jack/outlet from the left in the room, and 1-4 represents the four ports in the faceplate).

C. Copper Patch Panels:
   1. Label each patch panel with each unique patch panel name, expressed as a letter. Example: A for 1st patch panel, B for 2nd, C for third, etc.
   2. Label each port on the patch panels with a 1-line identifier as follows:
      a. Show the room number (room 103), followed by the jack/outlet number (J2) from the left when entering the room, followed by the port number within the outlet faceplate (1-6). Example: 103 J2:3 (where 103 is the room number, J2 is the 2nd jack/outlet from the left in the room, and 3 is the 3rd port in the faceplate).

D. Telecommunications Room:
   1. Label cable with wire number to denote the station outlet with appended cable number at each end. Cable ID tags shall be attached within 2 inches of cable end so that ID tag is visible within box.
   2. Provide an updated floor plan and list of telecommunication outlets cross-referenced to the rack, patch panel and port. Mount behind Plexiglas cover as specified in Section 16075.

E. Copper Horizontal Cable:
   1. Label the end of each cable with the same designation used on the equipment where the cable is terminated (i.e. the patch panel or telecommunications outlet). Labels shall be installed within one inch of the end of the cable insulation, after the insulation has been cut back to allow for termination.

F. Provide computer-generated Project Record Drawing drawings showing outlet locations, type, and designation. Turn these drawings over to the Owner's Representative two (2) weeks prior to substantial completion, to allow the Owner's Personnel to connect and test Owner-provided equipment in a timely fashion.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS – STRUCTURED CABLING SYSTEM

A. Throughout this specification, specific manufacturers and manufacturer's catalog numbers are cited. These citations are for the purpose of establishing quality and performance criteria and are not intended to be proprietary. All products in the structured cabling system shall be provided from one of the approved manufacturing partnerships listed below, or an alternate system shall be substituted under the provisions of Division 1. All decisions regarding approval of non-specified manufacturers and products will be at the discretion of the City.
   1. Belden.

2. Ortronics/Superior Essex.
3. CommScope Uniprise.
4. Hubbell/Mohawk.
5. Leviton/Berk-Tek.
6. TE Connectivity (formerly ADC/Krone/Amp).
7. Substitutions: Under provisions of Division 1.

B. Structured Category 6 cabling systems shall include, but not be limited to, UTP telecommunications cable, UTP jacks, faceplates, modular patch panels, and UTP patch cables.

2.02 TELECOMMUNICATIONS BACKBOARD

A. Material: ACX Plywood, painted to match the surrounding walls with fire-rated paint.

B. Size: As indicated on drawings, ¾" thick.

C. Grounding Busbar: Wall-mounted, solid copper, 12 inch by 4 inch by ¼ inch thick busbar with two insulators and standoff brackets. Chatsworth #40153-012 or approved equal.

D. Cable Support: Provide cable management rings and cable support straps for all cables routed on backboard.

2.03 TELEPHONE PUNCHDOWN BLOCKS

A. Wall-mounted type 66 block for cross-connect with incoming telephone utility cable: 50-pair capacity with cable management.
1. Siemon S66B3-50 or approved equal with S20A cable management

2.04 TELECOMMUNICATIONS EQUIPMENT RACKS

A. Acceptable Manufacturers – Rack Equipment.
1. Chatsworth.
2. Cooper B-Line.
3. Hubbell.
4. Ortronics.
5. Substitutions: Under provisions of Division 1.

B. Floor Racks: Chatsworth #46353-703 or approved equal, seven-foot high, self-supporting, floor mounted, pre-drilled and tapped, 19 inch, aluminum EIA equipment rack with black finish. The floor rack shall have the following features:
1. Vertical Cable Manager:
   a. In Between Racks: Chatsworth "Evolution Series" #35573-703 or approved equal double-sided 10" wide vertical cable manager with black finish.
   b. Ends of Rack Rows: One Chatsworth "Evolution Series" #35571-703 or approved equal double-sided 6" wide vertical cable manager with black finish on each side of the rack.
2. Rack Numbering: Provide RMU numbering on the rack.
3. Provide 12" wide cable tray (as specified in Section 16135) above each rack row and from rack row(s) to wall. Provide waterfall drops into back of each rack or cabinet.
4. Provide Chatsworth #10562-001 or approved equal universal earthquake bracing kit, along with all associated hardware required to seismically brace racks to wall.
5. One Chatsworth #40172-001 or approved equal vertical rack ground bar kit with pre-punched ground mounting holes. Mount the grounding bar along the front vertical rail of the equipment rack.
6. KVM Switch (MDF Only): Avocent "MergePoint Unity" #MPU108E or approved equal 8-port KVM over IP switch with 1 digital KVM path, remote access connection, dual network connections, and single AC power supply.

7. One Tripp-Lite #ISOBAR12-20ULTRA or approved equal rack-mounted surge protective outlet strip with 2 NEMA 5-15R outlets (front), 10 NEMA 5-20R outlets (rear), guarded On/Off switch, integral 15-amp circuit breaker, 15-foot cord, and black housing. Outlet strip shall have 3840 joules/96,000 amp network-grade AC surge suppression with EMI/RFI filtering. Mount outlet strip at base of rack.

2.05 UTP TELECOMMUNICATIONS CABLE

A. All UTP telecommunications cables that stay within the building envelope shall be UL listed, plenum-rated CL2P, Category 6, 4 pair, 23-24 AWG, solid copper conductor.
   1. Superior Essex “DataGAIN” CMP or approved equal.

B. All UTP telecommunications cables that exit the building envelope or are run in underslab raceway shall be UL listed, outside plant rated, Category 6, 4 pair, 23-24 AWG, solid copper conductor cable, injected with water-resistant flooding compound and jacketed with UV-resistant polyethylene jacket.
   1. Superior Essex “OSP Cat 6” or approved equal.

2.06 UTP TELECOMMUNICATIONS JACKS

A. All UTP telecommunications jacks shall be Category 6, T568A/B, 8P8C, single, white finish, telecommunications jack with flush exit. Unless otherwise noted on the drawings, install each telecommunications jack in a single gang faceplate at each telecommunications outlet. The quantity of faceplate openings shall match the quantity of jacks at each location. All jacks shall be wired using the T568B wiring configuration.

B. UTP Jacks:
   1. Ortronics “TracJack Clarity 6” #OR-TJ600 or approved equal.

2.07 TELECOMMUNICATIONS OUTLET FACEPLATES

A. Unless otherwise noted, all faceplates shall be single-gang plastic faceplates with white finish. The number of openings in each faceplate shall match the jack count of each outlet shown on the Drawings. (x in part numbers = designation for number of openings in faceplate).
   1. Ortronics “TracJack” #OR-4030054x or approved equal.

2.08 UTP MODULAR PATCH PANEL

A. Provide and install high-density Category 6, modular patch panels in each equipment rack. The front of the patch panels shall be equipped with T568A/B, 8P8C Category 6 compliant jacks. The jacks shall be factory wired to a 110 type IDC connector. The complete assembly shall exceed the requirements of TIA/EIA 568-B (Category 6), and be factory tested to 1000 Mbps data rates. Install the number of patch panels in each equipment rack as shown on the drawings or as required to terminate all UTP cables at the rack plus 25% spare capacity. All patch panel ports shall be wired using the T568B wiring configuration.
   1. 24-port Panel: Ortronics “Clarity6” #OR-PHD66U24 or approved equal.
   2. 48-port Panel: Ortronics “Clarity6” #OR-PHD66U48 or approved equal.

2.09 UTP CABLE MANAGEMENT PANELS

A. Horizontal cable management panels shall have five metal horizontal cable rings. Unless otherwise noted on the drawings, install one cable management panel between each patch panel and below the last patch panel.
   1. 1 RMU Panel: Ortronics #OR-60400131 or approved equal.
   2. 2 RMU Panel: Ortronics #OR-60400057 or approved equal

2.10 UTP PATCH CABLES

A. All patch cables shall be factory manufactured to match the applicable cable/connectivity solution (i.e. the Ortronics/Superior Essex system shall use Ortronics manufactured patch cords, etc.).

B. Telephone Cross-Connect: Provide 7-foot Category 6 patch cables with white jacket for cross-connect between the telephone patch panel and the telecommunications patch panels. Provide one patch cable for each port in all the telephone patch panels.
   1. Ortronics #OR-MC607-09 or approved equal.

C. Network Equipment Connections: Provide Category 6 patch cables with blue jacket for installation between network equipment in the rack and dedicated data ports in the telecommunications patch panels. Provide one patch cable for each port in all the telecommunications patch panels. Where the patch panels and switches are in the same rack, provide 7' cables. Where the patch panels and switches are in different racks, provide 15' (14' for CommScope) cables. (xx in part numbers = cable length)
   1. Ortronics #OR-MC6xx-06 or approved equal.

D. VoIP Connections: Provide 7-foot Category 6 patch cables with yellow jacket for cross-connect between the VoIP switch ports and the telecommunications patch panels. Provide 48 patch cables for each 48-port patch panel installed.
   1. Ortronics #OR-MC607-04 or approved equal.
   2. Network Equipment Connection: Ortronics #OR-MC6xx-09 or approved equal. Where the wireless controller and network switches are in the same rack, provide 7' cables. Where the wireless controller and network switches are in different racks, provide 15' cables. (xx in part numbers = cable length).

E. Computer Connections: Provide 9-foot Category 6 patch cable with white jacket for installation between the data jacks in each telecommunications outlet and the Owner-provided computers. Provide one patch cable for each data jack in all the telecommunications outlets, plus 25% additional cables for future expansion or replacement cables.
   1. Ortronics #OR-MC609-09 or approved equal.

2.11 CABLE SUPPORT

A. All cables not installed in conduit shall be supported in accordance with Section 16135.

B. All cables not installed in conduit shall be supported using J-hooks, Caddy CableCat series or approved equal, with a minimum J-hook size equivalent to Caddy #Cat32 or approved equal. Size all J-hooks to support the quantity of cables installed, plus a minimum of 25% spare capacity. Fiber optic cables shall be routed in 1" innerduct that is supported on a separate J-hook above the J-hook supporting the copper cables.

C. Cables shall be bundled using Velcro "One-Wrap" or approved equal reusable straps with a minimum ¾ inch width. Plastic tie-wraps or cinch-straps are not allowed.

2.12 EXTRA MATERIALS

A. Furnish to the owner the following spares parts:
   1. Five (5) percent of each type of UTP telecommunications jack.
   2. Five (5) percent of each type of telecommunications faceplate.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work.

3.02 GENERAL INSTALLATION

A. Follow cable manufacturer's specification regarding handling methods, retaining/support methods, bending radius and maximum pulling tension limitations. Where manufacturer does not provide bending radius information, minimum bending radius shall be 10 times the diameter of the cable. Use a tension-monitoring device to ensure that the maximum pulling tension that may be applied to the cable to be pulled into a conduit section is not exceeded. Provide replacement cable if cable manufacturer's maximum pulling tension is exceeded at any time during a pull.

B. Cable shall be carefully inspected for sheath defects or other irregularities as it is paid out from the reel. When defects are detected, pulling shall stop immediately and the cable section shall be repaired or replaced at the discretion of the Contracting Agency. A system of communications shall be maintained between pulling and feed locations so that pulling can be stopped instantly, when required.

C. Adequate care shall be exercised when handling and storing reels of cable to prevent damage to the cable. Cable with dents, flat spots, or other sheath distortions shall not be installed.

D. Install termination backboards plumb, and attach securely at each corner.

E. Store a maximum of one foot of slack UTP cable for each UTP jack at each telecommunications outlet.

F. In the telecommunications closet, ten feet of slack UTP cable shall be provided at the racks. Route the service loop around the cable runway above the racks. No cables shall encroach or interfere with rack equipment space. All cables shall be protected from physical damage and should not be routed on the floor. Coiling the slack cable adjacent to the rack is not acceptable. The intent of this installation method is to provide slack cable for future work without causing increased inductance by coiling the cables.

G. All cabling shall be run continuous with no splices from each telecommunications jack to the cable connector at the patch panels. Telecommunications cables shall be terminated at each end on their respective jack. No cable run shall exceed 90 meters (295 feet) in length from the jack on the peripheral end to the patch panel.

H. All cable shall be routed in such a way as to minimize EMI and RFI interference. Cables shall be routed to maintain the following minimum distances from noise producing devices:
   1. Open or Nonmetallic Communications Pathways:
      a. 12 inches from electrical equipment and power lines of 3 kVA or less.
      b. 18 inches from fluorescent and HID ballasts.
      c. 36 from electrical equipment and power lines greater than 5 kVA.
      d. 48 inches from transformers and motors.
   2. Grounded Metal Conduit Communications Pathways:
      a. 3 inches from electrical equipment and power lines of 2 kVA or less.
      b. 6 inches from electrical equipment and power lines of 2 kVA to 5 kVA.
      c. 12 inches from 5 kVA or greater power lines.

3.03 TERMINATIONS

A. The jacket of UTP cables shall be maintained to a point within one inch of the telecommunications jack. The twists on the individual pairs shall be maintained as close as possible to the contacts of the termination points but shall in no case exceed 1/2 inch.

B. Pairs from each cable shall be terminated sequentially from left to right, top to bottom starting with the lowest assigned number at the upper left-hand corner of the panel.

3.04 PATHWAYS AND RACEWAYS

A. Unless otherwise noted, all cables shall be installed in conduit from the telecommunications jack to the equipment rack. Portions of cables not installed in conduit shall be supported in accordance with TIA/EIA standards at intervals not exceeding four (4) feet in length using J-hooks. The cable shall not be supported from ducts, pipes, conduits, ceiling grid hangar wires, etc. At any point where the cable changes direction, slack shall be provided to prevent rubbing or binding on the corner supports. Extreme care shall be taken to ensure that the cable is not compressed, kinked or otherwise deformed during installation. Any cable that is stretched, compressed, kinked or otherwise deformed shall be replaced at no cost to the City.

B. Cables to be installed in raceway or continuous cable support system or J-hooks (as specified above) for the entire length of each cable. Provide raceway through areas that will not be accessible for future cable replacement or additions.

C. Provide pathway capacity throughout entire system for each telecommunication outlet served, sized to accommodate a minimum of four 4-pair cables from each outlet location to the designated telecommunication room, as shown on the plans.

D. Telecommunication cables shall not be installed in the same raceway or pathway as power cables.

E. Install polyethylene pulling string in each empty conduit containing a bend or over 10 feet in length.

F. Install all telecommunications outlets in outlet boxes under the provisions of Section 16130. Unless otherwise noted on the Drawings or in the Specifications, outlets shall be mounted at 48 inches above floor, 4 inches above counters or backsplash, with the jacks oriented in the standard “pins down” position..

G. Support raceways, outlet boxes, junction boxes and equipment racks under the provisions of Section 16190.

3.05 LABELING

A. Label equipment racks as noted here-in and under the provisions of Section 16195.

B. Furnish and install labels and documentation to identify all cables, jacks, and connections in accordance with TIA/EIA standards, as shown on the Drawings, and under the provisions of Section 16195. As a minimum each jack in each faceplate shall have a unique identifier that matches the identifier at the patch panel. Identifiers shall be installed on the front of the telecommunications faceplate, on the cable behind the faceplate, and on the front of the patch panel at the associated jack.

3.06 GROUNDING

A. Provide and install as indicated on the Drawings a #2 AWG, copper telecommunications bonding backbone (TBB) conductor from the wall-mounted telecom main grounding busbar (TMGB) in the telecom room to the ground bus in the main switchboard.

B. The TBB shall be routed along the telecom backbone pathway. In areas above accessible ceilings, the TBB conductor may be routed exposed. In inaccessible areas, the TBB conductor shall be routed in conduit and shall be bonded at both ends. All grounding and bonding shall be done in accordance with TIA/EIA standards.

C. Provide and install a #2 AWG, copper telecommunications bonding backbone (TBB) conductor from the ground bar in telecom rack (TGB) to the wall-mounted telecom main grounding busbar (TMGB).

3.07 CABLE ACCEPTANCE TESTING

A. Each UTP cable shall be tested for compliance with TIA/EIA 568C Category 6 standards after installation using a Fluke #DTX or approved equal tester that has been calibrated within the last 30 days. At a minimum, the Contractor shall perform the following tests with the maximum frequency of the tester set at 350MHz:
   1. Signal Attenuation / Insertion Loss
   2. Near End Cross Talk (NEXT)
   3. Power Sum Near End Cross Talk (PS-NEXT)
   4. Equal Level Far End Cross Talk (ELFEXT)
   5. Power Sum Equal Level Far End Cross Talk (PS-ELFEXT)
   6. Attenuation to Crosstalk Ratio (ACR)
   7. Power Sum Attenuation to Crosstalk Ratio – Near End (PSACR-N)
   8. Power Sum Attenuation to Crosstalk Ratio – Far End (PSACR-F)
   9. Propagation Delay
   10. Delay Skew
   11. Return Loss
   12. Wiremap
   13. Overall Cable Length

B. Test, analyze, and record compliance for the following network protocols:
   1. 10 Base-T
   2. 100 Base-T
   3. 1000 Base-T (1 Gb/s)

C. The Contractor shall provide 100% testing for each “permanent link” (i.e. from the work area outlet to the patch panel). Provide test results for all tests noted above in the form of printouts from the test equipment and provide an electronic copy of the test data for each cable on CD. If proprietary software is used, the submitted CD shall include any necessary software required to view test results. If the results are delivered in a standard format such as Excel or Access, the viewing software need not be provided. At the front of the test report, the Contractor shall provide an index showing the pass/fail results of each cable, along with the cable length and a corresponding cable label.

D. Where any portion of the system does not meet the Specifications, the Contractor shall correct the deviation and repeat any applicable testing at no additional cost to the Owner.

E. Submit a copy of the test report for each cable prior to substantial completion of the project.

F. Acceptance of the telecommunications system shall be based on the results of the above tests, functionality, and the receipt of documentation.

G. Prior to Substantial Completion, submit the measured values for the telecommunications rack AC ground resistance and the voltage at the dedicated plug strip on the telecommunications rack.

3.08 SYSTEM CROSS-CONNECT

A. Provide all labor and materials as required to cross-connect between the installed telecommunications cabling system and the Owner’s telephone and computer systems. This shall include the following:
   1. Network System: Provide cross-connect between Owner’s network switches and the installed fiber patch panels and horizontal patch panels. The intent is to assist the Owner in activating designated computer ports throughout the facility. All network programming required for this function shall be provided by the Owner under separate Contract. For

bidding purposes, assume a total of 50 cross-connections between the network cabling system and the active equipment.

END OF SECTION

SECTION 16766

SECURITY ALARM AND DETECTION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Security system.

1.02 RELATED WORK

A. Section 16111 - Conduit.

B. Section 16120 - Wire and Cable.

C. Section 16130 - Boxes.

1.03 SYSTEM DESCRIPTION

A. Provide a fully supervised security system to monitor the designated area and transmit local and remote alarm signals to City emergency personnel.

B. Provide a minimal coverage security system as shown on the drawings and specified herein. The system shall include, but not be limited to, magnet switches, glass break sensors, motion sensors, alarm horns, keypads, remote dialer and main control panel. Provide all power supplies, conduit, wire, fittings, devices, and accessories as required for a complete operating system.

C. Sequence of Operation:
   1. Upon actuation of any automatic detection device, breaking of any magnetic contact or keypad initiated alarm, all alarm functions shall operate in appropriate fashion. Alarms shall continue to be actuated until manually reset on-site by authorized personnel.
   2. The following additional functions shall be performed in the event of an alarm as shown:
      a. Security alarms shall activate the remote signaling circuit of the security panel which shall seize the first voice line and dial a pre-recorded alarm message to the locations specified by the Owner. If the first voice line seized is not usable the second voice line shall be seized. Security panel shall transmit to a second telephone number, a duplicate of all the information sent to the first telephone number.
      b. Shutdown of the system shall be accomplished at the panel by authorized personnel.
   3. The arming procedure shall be as follows:
      a. Entering the arming code on the keyboard shall cause the system to be armed.
      b. System shall give visual and audible indication if it is armed while a non-auto-shunted zone is in trouble status. A low battery condition shall give an audible alarm upon arming.
      c. After system has been successfully armed, the exit delay period (user programmable up to four (4) minutes shall begin (if the delay has not been canceled by the operator), allowing the operator to exit the building without causing an alarm.
   4. The disarming procedure shall be as follows:
      a. Entering the disarming code on the keyboard shall cause the burglary zones to be disarmed. The other zones shall remain in operation.
   5. To enter the programming mode, the user shall be required to enter the correct keypad programming authorization code.

1.04 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 1.

B. Shop drawings shall consist of:
   1. Wiring diagram and control panel wiring diagram identifying by type and location all components of the system, including notation showing power to, and actual connection wire run between, all components of the system. Zones will be separately color coded linking all zone devices unless zone expansion is used, then each device will be color coded as to zone regardless of actual wire run.
   2. Show exact location of each power device not located in the panel. Provide a list of devices powered by each such power device, indicating individual device power requirements and total drain on the power device assuming simultaneous activation of all devices powered by the power device, including auxiliary power supply of the main panel.
   3. Provide a list of devices identified by number. Mark wiring by corresponding number to show wire run.
   4. Provide a schematic drawing of each controller indicating, by device number, the location of all panel wiring connections. This numbering system must be consistent and used throughout. Place a copy of this drawing inside the device enclosure.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site, store and protect under provisions of Division 1.

B. All security equipment, wiring, etc. shall be stored in an enclosed area, maintained at a minimum of 55º F and shall be protected from weather.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in security systems with a minimum three years documented experience in Alaska.

1.07 EXTRA MATERIALS

A. Provide spare parts under provisions of Division 1.

B. Provide two (2) keys of each type.

C. Provide two (2) magnetic door switches.

D. Provide two (2) motion sensors.

1.08 WARRANTY

A. Warrant all materials and equipment to be new and free from defects in material and workmanship for a period of one year under provisions of Division 1.

1.09 PROJECT RECORD DRAWINGS

A. Submit documents under provisions of Division 1.

B. Provide contract size reproducible documents showing the as-built location of all clocks, conduit routing, and all junction box locations.

1.10 OPERATION AND MAINTENANCE MANUALS

A. Submit data under provisions of Division 1.

B. Provide operation and maintenance instructions including detail electronic schematic drawings, detailed parts list and exploded view of all equipment, detailed troubleshooting instructions and a reduced set of the project record drawings.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS – SECURITY PANEL CONTROL UNIT

A. Napco.

B. Substitutions: Under provisions of Division 1.

2.02 SECURITY PANEL CONTROL UNIT

A. Control Unit
   1. Solid-state, microprocessor-based, modular design security panel control unit with keypad n a flush mounted enclosure.
   2. Power Supply: Adequate to serve all control panel modules, initiating devices, notification appliances, plus 25 percent spare capacity to allow for future system load growth. Include battery-operated emergency power supply with capacity for operating system in standby mode for 24 hours followed by alarm mode for 5 minutes. Size battery capacity to allow for a 25 percent growth of the system load while complying with the above requirements.
   3. Control Relays: Provide sufficient addressable control relays to provide accessory functions specified and required by the drawings.

B. Keypad
   1. Keypad shall have the following factory supplied features:
      a. English language LCD display backlit.
      b. LED and sounder annunciators.
      c. Provisions for medical emergency, fire, panic alarms at keypad.
      d. Locate and Fault-Find Modes facilitate testing and troubleshooting.
      e. Audible indication of a faulted zone returning to normal condition.
      f. Sixteen access control codes and one electric door lock programmable from the keypad.
      g. Single button reset of the fire (supervisory) zone indicators, latched detectors and day zone indication.
      h. Separate supervisory zone indication.
      i. Capability of arming while powered by the standby battery.
      j. Activation of a panic alarm on one 24 hour auxiliary zone.
      k. Digital zone identification by pressing a digit key.
      l. Digital display of shunted zone numbers.
      m. Illuminated keypad.
   2. Keypad shall have the following user programmable options:
      a. Audible indication of dial tone detection success or failure.
      b. Manual zone shunting individually and/or by group.
      c. Ambush code disguised as disarming code shall transmit a silent alarm if an intruder forces the user to disarm.
      d. Fall back code shall set the system to either armed or disarmed status on power up. This code shall also allow arming/disarming if and only if no keypad programmed user codes are loaded.
   3. Provide keypad in locations shown on plans.
   4. Keypads shall be NAPCO RP3000LCD or approved equal with heavy duty cover. STI #6500 or approved equal.

C. Provide to the Owner's representative one complete copy of the programming and downloading software (PC-compatible).

2.03 ACCEPTABLE MANUFACTURERS – INITIATING DEVICES

A. Sentrol.

B. Substitutions: Under provisions of Division 1.

2.04 MAGNETIC DOOR SWITCHES

A. Switch rated 1 ampere maximum at 24 VDC, 500 mA.

B. Contact transfer time 10 milliseconds maximum.

C. UL listed for indoor and outdoor use under UL Standard 634.

2.05 MOTION SENSORS

A. Dual Technology (Microwave/Passive Infrared (PIR)): Wall mounted detector with one set of form C security alarm contacts and one set of NC tamper contacts. 12 VDC, stand-alone, UL listed, with built-in tamper and LED detection indicator. The IR sensitivity portion of the detector shall detect a 2.0 degree Celsius target to background differential, and detect a target motion at 2.0 feet per second or better, and shall have detection pattern adjustments of +/- 5% vertical and +/- 5% horizontal.

2.06 GLASS BREAK SENSORS

A. Honeywell FlexGuard No. FG1615 or approved equal.

2.07 ACCEPTABLE MANUFACTURERS – NOTIFICATION APPLIANCES

B. ATW.

C. Substitutions: Under provisions of Division 1.

2.08 SECURITY HORN

A. Weatherproof, corrosion resistant housing.

B. 119dB output minimum.

C. Suitable for surface mounting on a 4” square box.

2.09 REMOTE DIALER

A. EEPROM and non-volatile memory based dialer capable of delivering customized, recorded messages to telephones and a numeric code to pagers.

B. Can automatically call a minimum of four (4) phone numbers.

C. 12 character LCD display and keypad.

D. Playback speaker for voice messages.

3 EXECUTION

3.01 INSTALLATION

A. General: When detectors, switches, and keypads are called for, it is implied that finished work, including conduit, transformer covers, junction box covers, outlets, raceways, and wiring are included.

B. Location: The Contractor shall note that locations of motion detectors shown on drawings are the preferred areas of placement. However, the Contractor shall be responsible for the final location of each detector for optimal coverage, stability, and acceptable performance. The motion detectors shall be placed to avoid false alarm sources. Do not mount the detector in a location where environmental factors (background disturbances for the microwave component and heat sources for the infrared component of the detectors) exist which may lead to false alarms or microwave lock out.

C. Circuit zoning: Circuits shall be zoned and connected to the alarm control panel as shown on the drawing. If not shown on drawing, contact Contracting Officer's Representative for written zone configuration requirements. Each end of line device should be a separately identifiable zone.

D. Equipment: Install equipment fully in accordance with manufacturer's directions and recommendations for installation.

E. Wiring: Alarm and sensor loop wire shall be no larger that 16 AWG nor smaller than 22 AWG unless specified otherwise here or by the alarm equipment manufacturer. Low voltage DC power wire shall not be smaller than 18 AWG nor larger than 12 AWG. Wire gauge should coincide with the length of wire to be run and wire will be stranded conductor. Environmental conditions may require shielded cable for RFI or EMI conditions.

F. End of Line Resistors: End of line Resistors will be placed at the detection end of the loop and within the detection device where physical space permits, NOT in the controller. Where physical space does not permit, the EOLR will be soldered in line (or equivalent) as close to the device as possible and covered with heat shrink.

G. Battery Backup: Install manufacturers recommended, or better, standby batteries and connect to CCP. Devices powered from the panel will not exceed 90 per cent of the maximum panel power output, calculated at maximum draw on all devices simultaneously.

H. Workmanship: All materials and workmanship provided by the Contractor shall be in accordance with the best practice of the state of the art of the security systems installation trade and shall meet Underwriters Laboratories (UL) Standards for Safety including UL 681, National Fire Protection Association (NFPA) requirements, National Electric Code (NEC), and applicable state and local codes. The installation shall be suitable in every respect for satisfactory operation.

I. Provide connection to remote dialer in accordance with manufacturer’s instructions.

3.02 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Division 1.

3.03 MANUFACTURER’S FIELD SERVICES

A. Provide instruction to designated personnel as necessary to ensure that they can operate, load data, and program as needed the command center keypads, and other user devices. Employee training on the system will be conducted by the contractor after completion of the installation and before the final inspection.

B. At the time of the final inspection, personnel trained must demonstrate the capability to perform the above tasks by arming and disarming the system, and performing all the activated functions on the command center keypad.

END OF SECTION

SECTION 16900
ELECTRICAL CONTROLS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnish, install, and test the hardware, conduit, wiring and control panels required to operate the Pyramid water treatment and appurtenances, and other water treatment equipment as indicated in the contract documents, the following Functional Specifications and as depicted on the drawings. Major parts of the system are:
   1. MAIN CONTROL PANEL (MCP) with all components as shown on the drawings. (New Control Panel)
   2. UVR-101A and UVR-101B Ultraviolet Reactor systems (New by Manufacturer) – See Specification Section 15215
   3. PMP-101, 102, 103 and 104 chlorine supply pump motor starters (See Specification Section 15480)
   4. SMTV-101, 102, 103 AND 104 chlorine Regal SMART VALVES
   5. M-101, M-102 and M-103 Magnetic flow meter (See Specification Section 15285)
   6. PT-101, 102, 103, 104, 105, 106, 107, 108, 109, 110 and 111 pressure transmitters (See Specification Section 15214)
   7. AIT-101 AND 102 turbidity transmitters (See Specification Section 15282)
   8. AIT-103 and AIT-104 pH transmitters (See Specification Section 15283)
   9. TT-101 and TT-102 temperature 10. TT-103 air temperature transmitter
   11. CL17-1 and 2 Chlorine residual transmitters (See Specification Section 15284)
   12. UVT-1 and 2 transmittance transmitter (See Specification Section 15281)
   13. V-101, V-102A, 102B, 103, 104, , , 105A, 105B, 106A,106B,107A, and 107B AUMA open/close valve actuators (See Specification Section 15271)
   14. V-109A and 109B CLA-VAL modulating valves (See Specification Section 15216)
   15. Other Miscellaneous equipment
   14. Chlorine room and equipment (New by Manufacturer)
   15. Furnish, install, test instrumentation and related appurtenances, and integrate with controls system as indicated in the following Specifications and as depicted on the drawings.

B. WORK EXCLUDED
   1. Main control panel PLC and SCADA programming is excluded from this contract except for those panels provided by equipment manufacturers or otherwise identified in other sections of the contract documents.

C. RELATED SECTIONS
   1. Section 15215 – UV Reactors
   2. Section 15216 – Modulation Valves
   3. Section 15214 – Pressure Transmitters
   4. Section 15260 – Piping and Specialties
   5. Section 15270 – Process Valves and Operators
   6. Section 15271 – Motor Operated Butterfly Valves
   7. Section 15281 – UV Transmittance Transmitter
   8. Section 15282 – Turbidity Transmitter
   9. Section 15283 – pH Transmitter
   10. Section 15284 – Chlorine Residual Transmitter
   11. Section 15285 – Magnetic Flow Meter
   12. Section 01810 – Commissioning13. Specification Division 16 – ELECTRICAL.

D. SUBMITTALS
   1. Shop Drawings: Provide two hard copies plus electronic copies for each system or control panel.

a. Provide scale drawings detailing component layouts, interior and exterior for each control panel.
b. Provide material lists for each control panel and associated field devices. Include the following.
   1) Numerical identification of each component.
   2) Manufacturer.
   3) Part number.
   4) Description.
c. Provide control wiring diagrams.
d. Identify installed spares and provisions for future work (panel space, wiring and terminals).
e. Provide product data sheets for each device.
f. Complete catalog information, descriptive literature, specifications, and identification of materials of construction.

2. Quality Control Submittals:
   a. Manufacturer's Certificate of Proper Installation and Operation for the MCP.
   b. Shop test and inspection results and data.
   c. Four copies of each system or package Operation and Maintenance Manual.
   d. Manufacturer's Certificate of Compliance.

E. CONTROL SYSTEM HARDWARE SUPPLIER
1. The Control System Hardware Supplier shall be responsible for the complete, detailed design and manufacturing of the Main Control Panel. The system shall be designed to provide all of the functionality as described by these specifications and the drawings.
2. The Control System Hardware Supplier shall be a UL or ETL Listed panel shop with at least three years of experience in the design and manufacturing of this type of control system.
3. All control Panels manufactured under this contract shall be UL Listed in accordance with requirements of UL Standard 508A. Depending on the ultimate use of the panel, each panel shall be listed as either an "Enclosed Industrial Control Panel" or an "Enclosed Industrial Control Panel Relating to Hazardous Locations with Intrinsically Safe Circuit Extensions".
4. Owner shall have the opportunity to trouble shoot control panels at the hardware supplier's shop prior to shipment.

F. HARDWARE SUPPLIER'S FIELD SERVICES
1. Representative/s of the Hardware Supplier shall be present at the job for a total of eight days (over three separate trips), for installation assistance, inspection, testing, start-up and job-site training. The representative/s shall be fully qualified to test, calibrate, start up and train the Owner's staff for each of the control panels fabricated under this contract.
2. Following site inspection, the Hardware Supplier shall issue a Manufacturer's Certificate of Compliance indicating satisfactory installation and operation for work performed under this section.

G. DELIVERY, STORAGE AND HANDLING
1. Control components shall be protected from corrosion during shipping and storage.
2. Ship and store equipment with corrosion-inhibitor systems as recommended by the equipment manufacturer.
3. Protect equipment during shipping from saltwater spray and freezing as recommended by the equipment manufacturer.
4. Store equipment in clean, dry, well-ventilated area. Protect equipment from freezing and provide heated storage areas as recommended by the equipment
5. Cover panels and other control elements to protect from rain, snow and/or dust during construction.

PART 2 PRODUCTS

2.01 GENERAL

A. Field devices and components incorporated in the control panels shall be UL Listed.

B. General use control panels shall be UL Listed and labeled as Enclosed Industrial Control Panels.

C. Control panels with extensions into hazardous locations shall be UL Listed and labeled as enclosed industrial control panels relating to hazardous locations with intrinsically safe circuit extensions.

D. FUNCTIONAL SPECIFICATIONS
   1. General
      a. Contractor shall be responsible for coordination of equipment dimensions. Enclosure sizes shown on drawings or specifications are minimums.
   2. Primary Control Station
      a. The water system will be controlled through a combination of manual and automated operations as further described in this document. Automated operations may be controlled at the Operator Interface (HMI) on the MCP, the Primary Control Station or PCS located at the site, the Water Utility Office.
      b. Programmable Logic Controller
         1) The programmable logic controller (PLC) will receive discrete and analog input from remote devices and instrumentation throughout the system. Using programming resident in the PLC, it will compute and deliver output signals that will control specific unit process operations and equipment such as pumps, valves, and other infrastructure.
      c. Computer Data Storage and Retrieval
         1) The PLC will work together with the HIM, a desktop computer at the PCS and with other equipment located at the Water Utility Office that will receive, time stamp, and store data received by the PLC from instrumentation within the treatment system. These stored data can be retrieved using trending software loaded onto the computer system. The specific types of data to be stored on the computer will be identified in process descriptions included in this document.
      d. Emergency Shut Down
         1) There will also be an emergency shut down control provide at the HMI. This will enable the operators to stop all automated or semi automated control sequences and devices upon selecting this control command at the HMI.
   3. Process and Instrument Diagrams
      a. The description of the control system is coupled with the process and instrument diagrams (P&ID's) are part of the Contract Documents. The P&ID's schematically illustrate the water treatment process including piping, valves, and equipment. Components of the water treatment system are assigned tag numbers in the P&ID's, which in turn are generally grouped according to their function in the treatment process.
   4. Main Control Panel Spare Parts
      a. The following spare parts shall be provided.
         1) One fuse of each type used in each panel. If power fuses are being provided, the number of fuses shall correspond with the number of phases that are fused.
         2) One spare pilot light for each color/type used.
         3) One spare selector switch for each type used.
         4) One spare pushbutton for each type used.
         5) One spare control relay for each type used (including timers and intrinsically safe).
   5. Control Panels
      a. MAIN CONTROL PANEL (MCP)
         1) Location: Pyramid Water Treatment Plant

2) General: This panel provides overall control and monitoring of all processes in the Water Treatment Plant. It accommodates hardwired I/O, Ethernet signals from control panels and data via an Ethernet radio modem. Communication with the SCADA system is provided through the PLC located in this panel. The human interface module (HIM) located on this panel provides for the setting of parameters.
3) This panel consists of the following equipment:
   (a) NEMA 4X, stainless steel, wall-mounted, control panel enclosure
   (b) Size: 36"W x 60"H x 12"D
   (c) PLC and I/O modules
   (d) Operator interface
   (e) Ethernet Switch
   (f) Circuit Breakers, fuses, transformer, power supplies, selector switches, push buttons, pilot lights, terminal blocks, relays, wire, etc.
   (g) Surge arrestor
   (h) Other equipment and materials as shown on the drawings
4) Control panel and field wiring to be in accordance with the drawings and the specifications.
5) Programming of the PLC and Operator Interface is not included in this contract.

b. UVR-101A UV Reactor Control Panel
1) Location: Treatment Plant process area
2) General: This control panel is provided by the reactor supplier
3) As a minimum, this panel provides:
   (a) Control of the UV reactor UVR-101A
   (b) Communication will be provided between the UVR reactor panel and the MCP. Output from the MCP to the UVR will include a 4-20ma flow pacing signal, and a RUN command provided by a dry contact in the MCP. Input to the MCP from the UVR will include a 4-20ma UV intensity signal, a dry contact indicating unit running, and a dry contact indicating an alarm condition. An Ethernet connection shall also be provided between the UVR and the MCP.
   (c) Other equipment and materials as specified in Section 15215.
4) Control panel and field wiring to be in accordance with the drawings and the specifications, including all applicable NEC, State of Alaska, and local codes.

c. UVR-101B UV Reactor Control Panel
1) Location: Treatment Plant process area
2) General: This control panel is provided by the reactor supplier
3) As a minimum, this panel provides:
   (a) Control of the UV reactor UVR-101B
   (b) Communication will be provided between the UVR reactor panel and the MCP. Output from the MCP to the UVR will include a 4-20ma flow pacing signal, and a RUN command provided by a dry contact in the MCP. Input to the MCP from the UVR will include a 4-20ma UV intensity signal, a dry contact indicating unit running, and a dry contact indicating an alarm condition. An Ethernet connection shall also be provided between the UVR and the MCP.
   (c) Other equipment and materials as specified in Section XXXXX.

d. Chlorine Room
1) Location: Treatment Plant process area
2) General: Provide conduit and wiring as required between the existing chlorine detection equipment and the MCP.

E. COMPONENT SPECIFICATION
1. General

a. Provide and install all control panels and field devices described herein or shown on the drawings unless specifically excluded.
b. Provide and install all conduit and associated wiring as described herein or on the drawings including panels furnished by the equipment manufacturers.
c. Terminate all wiring to equipment supplied under this contract.

2. PCA Computer
   a. OptiPlex 3010 Desktop with Windows 7 32-bit, Quad Core 6 MB 3.2GHz, 4GB 1600MHZ DDR3 ROM, 1TB SATA Drive, Microsoft Office 2010 Pro
   b. Monitor: Dell 32 inch, LCD 720
   c. Mouse: Provide right hand mouse equipped with scrolls.
   d. Speakers: Dell
   e. Productivity software: Microsoft Office 2010 Professional
3. Programmable Logic Controller (Compact Logix PLC)
   a. General
      1) Function: Programmable Logic Controller.
      2) Type: Microprocessor based Programmable Controller with RS-232 and Ethernet communication ports, Rackless design with separate CPU, Input and Output modules.
      3) Parts: Power supply, CPU, discrete input modules, relay output modules, analog input modules and analog output modules.
      4) Programming Software
   b. Processor Unit.
      1) Memory: Controller memory of 1.5Mbytes (750Kbytes) minimum.
      2) RAM Memory Back-up: Lithium battery. Low battery condition shall be indicated by an LED on the controller and shall be detectable by ladder logic.
      3) Nonvolatile Memory: Controller shall have the capability to use a Compact Flash memory card for backup of data, program logic and firmware. Controller shall be able to load from this memory on power up or corruption of RAM memory.
      4) Communications:
         (a) Ethernet: Integrated 10/100MB Ethernet/IP interface channel.
         (b) Serial: Dedicated RS-232C serial port that supports DF1 Master, DF1 Slave, DF1 point to point and DH-485 communication protocols..
      5) LED indicators for: Program or Run mode, CPU Fault, Forced I/O, Battery Low, and RS-232 activity.
      6) Online programming capability, including runtime program editing.
      7) Integrated Real Time Clock.
      8) Key Switch Positions for Program, Remote and Run.
      9) Manufacturer and Product: Allen-Bradley, CompactLogix Model 1769-L32E. (Local Representative: North Coast Electric, Anchorage – 800-989-5229, Seattle 800-426-9906). No substitutions.
   c. Discrete AC Input Modules.
      1) 16 Inputs.
      2) Operating voltage of 79 to 132VAC.
      3) Removable terminal blocks with barriers on three sides.
      4) LEDs to indicate the status of each input.
      5) Optical Isolation between digital and field circuits.
      6) Wiring terminals with self-lifting pressure plates to secure two #14AWG wires.
      7) No tools shall be required to install or remove modules. Modules shall have latches for DIN rail mounting.
      8) Manufacturer and Product: Allen-Bradley, Model 1769-IA16. (Local Representative: North Coast Electric, Anchorage – 800-989-5229, Seattle 800-426-9906). No substitutions.
   d. Relay Output Modules (Non-Isolated).
      1) 16 relay outputs.

2) Voltage rating of 85 to 265VAC.
3) Continuous current rating per point: 2.5A AC.
4) Continuous current rating per module: 20A AC.
5) 8 Outputs per common.
6) Removable terminal blocks with barriers on three sides.
7) LEDs to indicate the status of each output.
8) Optical Isolation between digital and field circuits.
9) Wiring terminals with self lifting pressure plates to secure two #14AWG wires.
10) No tools shall be required to install or remove modules. Modules shall have latches for DIN rail mounting.
11) Manufacturer and Product: Allen-Bradley, Model 1769-OW16. (Local Representative: North Coast Electric, Anchorage – 800-989-5229, Seattle 800-426-9906). No substitutions.

e. Analog Input Modules.
1) 8 input channels per module.
2) Current inputs rated for 0 to +20mA or 4 to 20mA.
3) Current loop impedance of 250 ohms.
4) Voltage inputs rated for +-10VDC, 0 to 10VDC, 0 to 5VDC or 1 to 5VDC.
5) Resolution of 14 bits plus sign.
6) Current Input Overall Accuracy (at 25 deg C): + or – 0.3%.
7) Voltage Input Overall Accuracy (at 25 deg C): + or – 0.25%.
8) Input channel filtering.
9) Removable terminal blocks with barriers on three sides.
10) Wiring terminals with self lifting pressure plates.
11) No tools shall be required to install or remove modules. Modules shall have latches for DIN rail mounting.
12) Manufacturer and Product: Allen-Bradley, Model 1769-IF8. (Local Representative: North Coast Electric, Anchorage – 800-989-5229, Seattle 800-426-9906). No substitutions.

f. Analog Output Modules.
1) 8 output channels per module.
2) Current isolated outputs rated for 0 to +20mA or 4 to 20mA.
3) Removable terminal blocks with barriers on three sides.
4) Wiring terminals with self lifting pressure plates.
5) No tools shall be required to install or remove modules. Modules shall have latches for DIN rail mounting.
6) Manufacturer and Product: Allen-Bradley, Model 1769-OF4CI. (Local Representative: North Coast Electric, Anchorage – 800-989-5229, Seattle 800-426-9906). No substitutions.

g. PLC Power Supply.
1) Line Voltage: Nominal 24VDC.
2) Output rating: 4A at 5VDC, 2A at 24VDC (at 0 to 55 deg C).
3) Wiring terminals with self lifting pressure plates.
4) Manufacturer and Product: Allen-Bradley, Model 1769-PB4. (Local Representative: North Coast Electric, Anchorage – 800-989-5229, Seattle 800-426-9906). No substitutions.

h. Discrete 24VDC Input Modules.
1) 16 Inputs.
2) Operating voltage of 10 to 30VDC
3) Removable terminal blocks with barriers on three sides.
4) LEDs to indicate the status of each input.
5) Optical Isolation between digital and field circuits.
6) Wiring terminals with self-lifting pressure plates to secure two #14AWG wires.

7) No tools shall be required to install or remove modules. Modules shall have latches for DIN rail mounting.
8) Manufacturer and Product: Allen-Bradley, Model 1769-IQ16. (Local Representative: North Coast Electric, Anchorage – 800-989-5229, Seattle 800-426-9906). No substitutions.

i. Discrete High Speed 24VDC Input Modules.
1) 16 Inputs.
2) Operating voltage of 10 to 30VDC
3) Removable terminal blocks with barriers on three sides.
4) LEDs to indicate the status of each input.
5) Optical Isolation between digital and field circuits.
6) Wiring terminals with self-lifting pressure plates to secure two #14AWG wires.
7) No tools shall be required to install or remove modules. Modules shall have latches for DIN rail mounting.
8) Manufacturer and Product: Allen-Bradley, Model 1769-IQ16F. (Local Representative: North Coast Electric, Anchorage – 800-989-5229, Seattle 800-426-9906). No substitutions.

4. Operator Interface – PanelView Plus 6 1200, color, touch screen
   a. General
      1) Function: Provide a graphical operator interface to view data and change setpoints.
   b. Power: 18 to 30VDC, 1.0 A
   c. Operator Input: Touch screen.
   d. Display Type: Color, touch screen
   e. Communications: Ethernet, RS-232,
   f. Environmental Rating: NEMA 12, 13, 4X
   g. Manufacturer and Product: Allen-Bradley, Model PanelView Plus 6 1200. (Local Representative: North Coast Electric, Anchorage – 800-989-5229, Seattle 800-426-9906). No substitutions.
5. Radio Modem
   a. Furnished by Owner separate from this panel
6. Control Panel Enclosure
   a. NEMA 4X Enclosures: UL508 rated stainless steel, unpainted with brushed finish. Three-point or quarter-turn latching system with large locking handle.
   b. For wall-mount enclosures use Hoffman Concept type or approved equal.
7. Surge Arrestor
   a. Service voltage: 120V
   b. Protection levels: 330V
   c. Surge current rating: 700A
   d. Single phase for 30A circuit
   e. Response time: <5 Nanoseconds
   f. Illuminated status indicator and relay contact for alarm.
   g.
8. Selector Switches, Pilot Lights, Push Buttons
   a. NEMA 4X
   b. Pilot lights shall be LED type. Pilot lights for the MCP shall be shall be 30.5mm.
   c. Manufacturer and Product: Allen-Bradley, Series 800H (30.5mm) (Local Representative: North Coast Electric, Anchorage – 800-989-5229, Seattle 800-426-9906). No substitutions
9. Control Relays and sockets
   a. General Purpose Midget Relay, 10 Amp
   b. Contacts: Silver cadmium oxide

c. Life: Electrical over 500,000 operations.
d. Din rail mounted socket.
e. Minimum DPDT with indicator light.
f. Manufacturer and Product: Relay -- IDEC RH1B-UL and RH1B-UL, No exceptions.

10. Conduit
    a. Conduit shall be either Rigid Metal Conduit (RMC) or Rigid Non-Metal Conduit (RNC) or as shown elsewhere on drawings..
    b. All conduit shall be marked with waterproof tape in conspicuous locations displaying machine-printed conduit numbers ½" in size.
    c. Install and support raceways as specified in Division 16 Section "Basic Electrical Materials and Methods" or in accordance with manufacturers recommendation, whichever is more restrictive
11. Wire and conductors
    a. Conductor Insulation shall be XHHW-2
    b. All control wiring shall be stranded.
    c. TSP refers to twisted shielded pair cable with stranded, tinned copper conductors and will contain full shields and drain wire. The cable shall be approved for wet industrial environments. Use Belden 9341 or approved equal.
    d. All wire and cable terminations shall be marked with shrink type wire numbers for identification coordinated with the contract wiring schemes and indicated on the as-built drawings.
    e. source quality control
12. Test process instrument and control system elements at the control panel manufacturer's facility. Demonstrate that the system meets the control requirement described in the specifications and depicted on the drawings.
    a. Demonstrate function of each loop.
    b. Test each input and output.
    c. Verify that internal panel wiring is correct.
    d. Demonstrate PLC standard functions.
    e. Test timing requirements.
    f. Demonstrate online and offline diagnostic tests and procedures.
13. Correct deficiencies found prior to shipment.
14. Provide three copies of equipment manuals.
    a. The manuals shall include the following equipment items:
        1) All field devices.
        2) All major components used in the fabrication of the control panels such as: drives, motor starters, overload devices, fuses, disconnect switches, circuit breakers, human interface modules, PLCs (include I/O modules, CPUs, power supplies, communications modules, chassis, etc.), transformers, power supplies, surge arrestors, uninterruptible power supplies, pilot lights, selector switches, control relays, time delay relays, etc.
    b. The manuals shall also contain the following items:
        1) A material list with numbers referenced to equipment shown on the drawings and on the literature included in the manual. The material list shall serve as the Table of Contents for the equipment items.
        2) Descriptive literature and user's manuals for each item shall be provided.
        3) As-built drawings for each control panel including number tags for each conductor, terminal numbers, component terminal numbers, and a brief description of what each relay contact, switch position and controller output does in the control scheme. This description can be taken from the design drawings.
15. Provide written certification at the time of shipment that all of the tests indicated in Section A above was conducted at the fabrication shop. The certification shall include the following:
    a. Each test conducted shall be described.

b. The date the test was conducted shall be indicated.
c. Pass or fail shall be indicated.
d. Initials of technician conducting the test shall be provided.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install all control and electrical equipment as per the manufacturer's recommendations and to provide operation as described in the Functional Specifications and shown on the Drawings.

B. Perform electrical work as per the Electrical Specifications and as shown on the Drawings.

C. Control panels shall be manufactured in a UL panel shop in accordance with requirements of the most recent version of UL 508, and shall be properly UL labeled.

D. Provide as-built drawings and wiring diagrams.

E. Prior to Start-up of the facility, inspect, test and document that the control system is operational.

F. Calibrate components including but not limited to: analog devices, discrete devices, controllers, I/O modules and switches.

G. Provide written certification following Start-up, that all of the tests indicated in Section A above were conducted at the fabrication shop. The certification shall include the following:
   1. Each test conducted shall be described.
   2. The date the test was conducted shall be indicated.
   3. Pass or fail shall be indicated.
   4. Initials of the technician conducting the test shall be provided.

H. FIELD QUALITY CONTROL
   1. Functional and performance testing:
      a. Conduct on equipment installed per this specification. Perform under actual or approved simulated operating conditions. Test for a continuous 3-hour period without malfunction.
      b. The system shall be demonstrated to function properly under actual conditions described in the drawings process narrative with minor simulations allowed only as needed to test functionality where the actual physical condition cannot reasonably be simulated. Refer to Section 01810 for submittal of testing plan.

END OF SECTION

Part 6

DRAWINGS

Part 7

GEOTECHNICAL REPORTS

GEOTECHNICAL REPORT

for improvements to the

PYRAMID WATER TREATMENT PLANT
UNALASKA, ALASKA

Prepared for:

Larsen Consulting Group, Inc.
3710 Woodland Drive
Suite 2100
Anchorage, AK 99517

Prepared by:

Andy Smith – Project Geologist
Northern Geotechnical Engineering, Inc.

JULY 2010

2453-10

July 13, 2010 2448-10

Larsen Consulting Group, Inc.
3710 Woodland Drive
Suite 2100
Anchorage, AK 99517

Attn: Andrea Stancliff

RE: GEOTECHNICAL REPORT FOR IMPROVEMENTS TO THE PYRAMID WATER TREATMENT PLANT, UNALASKA, ALASKA

Andrea,

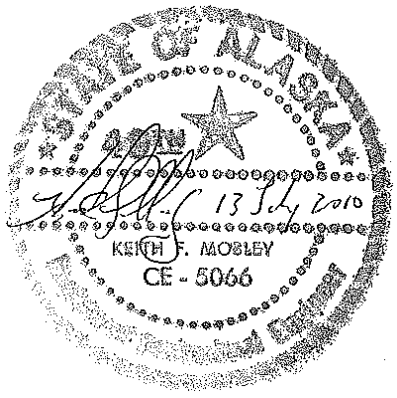
Northern Geotechnical Engineering, Inc. *d.b.a.* Terra Firma Testing has completed the geotechnical evaluation of the above referenced project as requested. Findings and recommendations are presented in the following report.

This opportunity to be of service has been appreciated. If you have any questions, please do not hesitate to contact me at your convenience.

Sincerely,
Northern Geotechnical Engineering - Terra Firma Testing, Inc.

Andy Smith
Project Geologist

Keith F. Mobley, P.E.
President



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FIGURES

APPENDICIES

1.0 INTRODUCTION

This report presents the results of field explorations, laboratory testing, and geotechnical engineering studies conducted at the site of the Pyramid Water Treatment Plant in Unalaska, Alaska. Northern Geotechnical Engineering, Inc. *d.b.a.* Terra Firma Testing (NGE-TFT) evaluated the subsurface conditions at three separate locations across the site to order to develop geotechnical engineering recommendations to aid in the design of proposed utilities and building foundations which are proposed to be constructed on the property.

Results of this study indicate that the native materials present on the site (located below the existing organic-rich materials) are capable of supporting the proposed structures. Recommendations concerning excavation/fill activities, utility installation, and foundation construction parameters are provided herein.

2.0 SITE DESCRIPTION

The site is located along Pyramid Creek Road, approximately two miles from its intersection with Captain's Bay Road in Unalaska, Alaska (Figure 1). The site is several acres in size and is located within an established utility/right-of-way easement owned by the City of Unalaska. The easement is surrounded on both sides by land belonging to the Ounalashka Corporation (an Alaskan Native Village Corporation).

The site topography generally consists of rolling hills and stream terraces located in a mountain valley along the east bank of Pyramid Creek. Pyramid Creek is deeply incised into the bedrock adjacent to the site, and forms a deep canyon as it flows towards Captain's Bay to the north of the site.

A large aboveground water storage tank (approximately 2.6 million gallon capacity) and associated pump house/chlorination building are located along the west side of Pyramid Creek Road.

Proposed improvements to the site include the construction a UV water treatment building. The building will either be added onto the existing pump house/chlorination

building, or be incorporated into a new stand-alone structure, and the existing pump house/chlorination building demolished.

3.0 SUBSURFACE EXPLORATIONS

NGE-TFT conducted field explorations at the site from June 24-25, 2010 to determine the subsurface conditions at the site as they currently exist. Three separate exploration areas were selected at the site by the Project Engineer (City of Unalaska) which correspond to potential building sites (Figure 2). The original exploration plan was to advance a boring at each of the three locations. However, the drilling contractor was only able to access one of the three proposed exploration locations due to the soft soils conditions and relatively steep terrain encountered at the site. Therefore, a small tracked excavator (owned and operated by the City of Unalaska) was mobilized to the site following the drilling activities to excavate test pits at all of the three proposed exploration locations.

3.1 Drilling Activities

NGE-TFT oversaw drilling activities at the site on June 24, 2010 to determine the subsurface conditions of the site as they currently exist. NGE-TFT contacted Denali Drilling (Denali) who in turn mobilized a truck-mounted Mobile B-61 drill rig to the site.

Denali advanced a single borehole, designated B-1, using a hollow-stem auger with a center rod. The approximate borehole location is shown on Figure 2. The surface elevation of the borehole was estimated relative to the existing water tank foundation and is recorded on the graphical borehole log presented in Appendix A. A representative of NGE-TFT was present onsite during the drilling to log the geology of the borehole and collect and prepare appropriate soil samples. Soil samples collected during the drilling activities were sealed in air-tight bags (to preserve the natural moisture content of the samples) and returned to the laboratory for further identification and analysis. The borehole was subsequently backfilled with drill cuttings.

Modified Penetration Tests were conducted at regular intervals during the drilling to assess the consistency of the soil. A Modified Penetration Test consists of driving a 2.8 inch O.D. split spoon sampler 18 inches past the bottom of the advancing hole with blows from a 340-lb auto-hammer free-falling 30 inches onto the drill rod. The number of blows required to advance a two-inch sampler the final 12 inches of the 18-inch penetration test (using a cathead operated hammer w/ two rope wraps) is termed the Standard Penetration

Resistance (SPR), and is recorded for each sample. Borehole data collected in the field was compiled with the laboratory results for each soil sample into a graphical log for each borehole drilled (Appendix B).

The blow counts recorded in the field were corrected for standard confining pressure, rod length, and hammer operation procedure to develop a standard N_{60} value. N_{60} values are measures of the relative density (compactness) and consistency (stiffness) of cohesionless or cohesive soils, respectively, and are displayed on the borehole logs in Appendix A. The corrections for the standard confining pressure and the rod length are shown in Figure 3. The borehole diameter used for this project is standard. However, the capstan-operated hammer (w/3 rope wraps) used is not standard, so a correction factor of 0.8 was applied to account for the hammer operation.

3.2 Test Pit Excavation

NGE-TFT oversaw test pit excavation activities at the site on June 25, 2010 to determine the subsurface conditions of the site as they currently exist. The City of Unalaska Public Works Department mobilized a small tracked excavator and operator to the site to excavate the proposed test pits. Five test pits, designated TP-1 through TP-5, were excavated at the three proposed exploration sites as directed by the Project Engineer. The test pits were extended to differing depths as instructed by the NGE-TFT field representative. The surface elevation of the individual test pits were estimated relative to the existing foundations (water tank & treatment building) and/or the Pyramid Creek Road Surface, and are recorded on the graphical test pit logs presented in Appendix B. Soil samples collected during the excavation activities were sealed in air-tight bags (to preserve the natural moisture content of the samples) and returned to the laboratory for further identification and analysis. The test pit excavations were subsequently backfilled with the excavated spoils.

4.0 LABORATORY TESTING

Twelve samples were collected from the six explorations and were submitted to our laboratory for moisture content, grain size, organic content, and frost classification analyses. These laboratory analyses, along with observations made during the drilling activities, aid in the evaluation of the subsurface conditions across the site.

Soil moisture content analysis for all 12 samples collected was conducted in general accordance with ASTM Test Method D-2216. Results of the analyses are presented on the borehole logs in Appendix A and in the laboratory summary sheets in Appendix C.

Grain size analysis for three of the 12 samples collected was completed in general accordance with ASTM Test Method D-422. Results of the analyses are presented in the laboratory summary sheets in Appendix C.

Five tests were conducted to determine the fines content of the soil. This test, termed the P200, was generally conducted in accordance with ASTM Test Method D-1140. Results of the analyses are presented in the laboratory summary sheets in Appendix C.

The organic content of one of the 12 samples collected was determined in general accordance with ASTM Test Method D-2974. Results of the analysis are presented on the borehole logs in Appendix A and in the laboratory summary sheets in Appendix B. It should be noted that the organic content is recorded as a percent of the weight of the inorganic fraction of the soil. As such, the volumetric fraction that is organic is approximately three to four times the weight percentage. As an example, a soil with an organic content of five percent by weight will have approximately 15 to 20 percent of the solid volume space filled with organic material.

Frost class analysis for one of the 12 samples collected was completed in accordance with ASTM Test Method D-422. Results of the analyses are presented on the borehole logs listed in Appendix A and on the laboratory summary sheets in Appendix C. One additional sample was also classified based on the grain size analysis which made it possible to confirm the classification.

5.0 SUBSURFACE CONDITIONS

Observations made during the exploration activities were compiled with the results from the laboratory analyses to generate graphical logs for each exploration (Appendices A & B). These logs display the subsurface conditions at each exploration location and allow for the interpretation of subsurface conditions for areas adjacent to, and immediately surrounding, the exploration locations.

The entire site (except for those areas which have been previously cleared) is overlain by an organic mat consisting of moss, lichens, and other vegetative matter. The organic mat varies in thickness, but is generally anywhere from 0.25 to 0.5 feet in thickness. The organic mat is underlain by a varying thickness of sand containing varying amounts of silt and fine-grained organic matter. The sand displays moisture contents ranging from 59 to 203 percent of the total sample mass, has a very soft/loose consistency, and is highly frost susceptible. The high moisture content observed in the sand material is in direct correlation to the organic content of the material (i.e. – high moisture content indicates larger organic fractions; as organic material can retain several times its own mass in water weight).

The sand material is underlain by a varying thickness of glacial till material consisting of varying amounts of silt, sand, and gravel. The till displays moisture contents ranging from eight to 17 percent of the total sample mass, has a very dense/stiff consistency, and is highly frost susceptible (F4). The till contains some cobbles/boulders in excess of 12" in diameter, and is underlain by weathered bedrock.

Groundwater was not encountered at the site and is not expected to occur at similar depths across the site.

All of the soils encountered during our explorations were in a thawed state, and permafrost conditions are not expected to exist across the site.

6.0 ENGINEERING CONCLUSIONS

With proper improvements the site is suitable for the planned development. The organic mat and underlying organic-rich sand are not suitable for structural support, and should be removed from the footprint of any proposed foundations and/or gravity-fed utilities. The underlying glacial till is sufficiently dense/stiff to support the proposed structures.

All three of the potential building sites evaluated during the exploration activities are suitable for supporting the proposed structures, and the selection of a building site will likely be guided by the final building and utility configuration and by project economics. All three areas will require varying degrees of earthwork to prepare the building pad for

construction. However, Areas #2 and #3 will likely require varying degrees of both blasting (bedrock) and placement of structural fill to develop a building pad large enough to adequately contain the proposed building (and any associated utilities, vehicle access, etc.). Therefore, Area #1 is likely the best suited for the proposed construction as little to no blasting and/or fill will likely be required to construct a suitable building pad.

7.0 ENGINEERING DESIGN RECOMMENDATIONS

The recommendations below are presented in the general order that the site will most likely be developed. The recommendations can be used in parts (as needed) for the final building design configuration.

7.1 Excavation and Fill Placement

As mentioned in Sections 5.0 and 6.0, the site is overlain by an organic mat and organic-rich sand material which are both unsuitable for supporting foundations and gravity-fed utilities as differential settlements will occur as loads are applied. We therefore recommend that the existing organic mat and organic-rich sand material be completely removed from the footprint of any proposed foundations, gravity-fed utilities, or areas to receive structural fill prior to construction. The over-excavation of the organic-rich materials should extend at least ten feet outside of the footprint of the proposed building to allow for minor foundation design modifications which may be added during the construction process.

Structural fill should be used to backfill areas where the existing organic–rich material is removed to below the proposed footing elevation. Existing glacial till material that is free of any organic material can be stockpiled and re-used onsite as structural fill assuming that it is placed at least 48 inches below the planned finished grade using proper placement and compaction techniques (discussed below). Any existing glacial till material which is stockpiled onsite for later use should be protected from additional moisture inputs (from precipitation, etc.) through the use of plastic tarps, etc., as additional moisture can have detrimental effects on the effort needed to achieve proper compaction.

In general it has been found that structural fill should have less than about 10 to 15 percent passing the #200 sieve for ease of placement. Siltier soils (such as the existing

glacial till found across the site) can be used within the foundation footprint if the structure is to be continuously heated or if the footings are to be placed more than seven feet below the finished grade. However, the effort required to achieve proper compaction of siltier soils may be more costly than purchasing and better grade materials. The time of year, existing moisture content, rainfall, and freezing conditions can all have an impact on the effort required to adequately compact silt-rich material. Silt-rich soils will also impact pavement sections and can result in uneven and cracked pavement surfaces (as a result of frost heaving).

Any and all fill material used should be placed at 95% of the Modified Proctor density as determined by ASTM D-1557, unless specifically stated in other sections of this report. The thickness of individual lifts will be determined based on the equipment used, the soil type, and existing soil moisture content. Typically, fill material will need to be placed in lifts of less than one foot in thickness. All earthworks should be completed with quality control inspection.

Any excavation into the existing organic-rich sand and underlying glacial till material encounter varying amounts of water infiltration as the excavation proceeds (especially at the silt/till interface or till/bedrock interface. Excess water will have a detrimental effect on fill placement and compaction efforts, and measures will need to be taken to ensure that foundation and utility excavations remain water-free. Shallow trenches should be excavated along the perimeter of any foundation excavation to collect water seepage and/or runoff (from groundwater and/or precipitation events) and direct it towards a collection/sump area, where it can be pumped out of the excavation.

7.2 Utilities

The finished grade elevation for the proposed improvements and utility profiles will determine whether or not groundwater is encountered within deep utility trenches (water and sewer). In general, large volumes of groundwater should not be encountered across the site. The native material in which deep utility trenches (<10 feet bgs) are to be constructed is composed of extremely dense glacial till material and/or bedrock, as such trench wall stability should be good, even in the presence of moderate amounts of groundwater. The contractor should be responsible for trench safety and regulation compliance. Piping should be installed prior to construction of the pavement section such that trenching is done through the subgrade soils only.

All pipes should be bedded per the manufacturers recommendation, with the bedding compacted to provide pipe support. Above the bedding materials, the backfill should be similar to the native soils and compacted to the density of the native soils. Well drained, coarse granular material (2" minus) will need to be utilized in areas where utility trenches extend below the groundwater surface.

7.3 Foundations

All of the native soils encountered in the explorations (located below the existing organic-rich soils) are suitable for foundation support. It is recommended that the buildings with conventional foundations be supported on continuous strip footings bearing directly on the existing glacial till material. Where the existing organic-rich soils are removed to below the foundation grade, structural fill placed as described in Section 7.1 can be assumed to perform as the native till. This material should be compacted to a minimum of 95% of the Modified Proctor density. A separation geo-textile fabric may be useful for placement of any fill material, but is not necessary.

Bearing Capacity

Footings placed on the existing glacial till (as discussed above) and/or structural fill (as discussed in Section 7.1) may be designed for an allowable bearing capacity of 3500 psf. These bearing values may be increased by 1/3 to accommodate short-term wind and seismic loads. The minimum horizontal dimension for continuous strip footings is 16 inches, and two feet for spread footings. Avoid placing isolated spread footings in unheated areas so as to reduce the potential for differential movements.

Floor Slabs

All floor slabs enclosed in continuously heated spaces can be constructed on structural fill material placed above the native glacial till material. Cold floor slabs are not recommended, however if required, they should be placed on granular structural pads constructed of NFS material with a minimum thickness of five feet (NFS material should have less than 6% of the material passing a #200 sieve).

As mentioned in Section 7.1, the upper fill material (at or above the footing grade) used to construct the structural pad for a heated building should be relatively free draining (sands and gravels) with less than 10% of the fill material passing through a #200 sieve. Furthermore, the top four to six inches of the structural pad located beneath the slabs

should be free draining, with less than 3% passing the #200 sieve. This "blanket" will serve as a capillary break to help maintain a dry slab. All of the fill material should be placed at a minimum of 95% of the Modified Proctor density. A separation geo-textile fabric may be useful for placement of the fill material, but is not necessary.

Slabs constructed on granular structural pads or the native glacial till, as described above, may be designed using a modulus of subgrade reaction equal to 220 pci.

Lateral Pressures

Retaining walls (such as perimeter foundation walls for buildings with basements or crawl spaces) must be designed to resist lateral earth pressures. The magnitude of the pressure exerted on a retaining wall is dependent upon: 1) whether the wall is allowed to deflect after placement of backfill; 2) the type of backfill used; 3) compaction rates; and 4) drainage provisions. The foundation stem walls should be backfilled on both sides simultaneously to prevent differential lateral loading of the foundation wall, as presented on Figure 5.

An active earth pressure condition will prevail (under static loading) if a retaining wall is allowed to deflect or rotate a minimum of 0.001 times the wall height (assuming that granular structural fill containing less than 10% fines is used as backfill and is compacted to 90% of the Modified Proctor density, and has drainage provisions preventing the buildup of groundwater on the wall face). If the aforementioned conditions exist, then the wall should be designed to resist the pressures exerted by a fluid with a density of 32 pcf. If drainage away from the wall is not provided, then wall design pressure should be calculated based on a fluid with a density of 90 pcf (this assumes that water is not allowed to accumulate on both sides of the wall).

An at-rest pressure condition will prevail if a retaining wall is restrained at the top and cannot move at least 0.001 times the wall height (assuming that granular structural fill containing less than 10% fines is used as backfill and is compacted to 90% of the Modified Proctor density, and has drainage provisions preventing the buildup of groundwater on the wall face). If these conditions exist, then the wall should be designed to resist the pressures exerted by a fluid with a density of 55 pcf. If drainage away from the wall is not provided, then wall design pressure should be calculated based on a fluid

with a density of 105 pcf (this assumes that water is not allowed to accumulate on both sides of the wall).

Lateral forces exerted by wind or seismic activity may be resisted by passive earth pressures against the sides of the foundation footings, exterior walls (below grade), and grade beams. These resisting pressures can be estimated based on the pressure distribution of a fluid with a density of 270 pcf. Lateral resistance may also be developed in the form of friction, generated along the base of the foundations and preventing sliding. This resistance generated may be calculated using a coefficient of 0.4 between the concrete and soil.

Settlements

Building settlements are expected to be within normal limits granted that proper compaction is performed prior to foundation construction. The total settlement anticipated for foundations placed on the dense glacial till or properly compacted structural fill placed above the dense glacial till is less than ¾-inch, with differential settlements comprising about ½ of the total settlement. Total and differential settlements amounts could increase substantially if structural fill material is used to bring the property up to grade is not properly compacted. Most of the settlements should occur as the building loads are applied, such that additional long-term settlements should be relatively small and within tolerable limits. The long-term settlement of the buildings is expected to be ¼ of an inch or less.

Seismic Design Parameters

It is assumed that IBC 2003 or 2006 will be used for design of the structures on site. For seismic design, the site classification is C. The design parameters are F_a=1 (S_s=1.5) and F_v=1.5 (S_1=0.58). The potential for soil liquefaction across the site is considered low.

7.4 Drainage

After the building site is brought to grade it should be nearly flat, such that storm water will tend to collect and flow off site slowly. Water accumulation will have a detrimental effect on foundations. Provisions should be included in the design to collect runoff and divert it away from any foundations. The soils on the surface should be tightly compacted to minimize infiltration.

Roof, parking lot, and driveway drainage should be directed away from any foundations. If storm sewer is available, tight line connections from roof drain collectors should be made.

7.5 Cut Slopes

Any slopes cut into the existing organic-rich sand or glacial till should retain a maximum slope of 1V:1.5H. Any slope which exceeds 20 feet of vertical relief will need to incorporate a bench with a minimum width of eight feet. All slopes should contain erosion protection measures.

7.6 Winter Construction

Winter construction is becoming more common in Alaska. It is imperative that building foundations remain in a thawed state for the entire construction period, especially when dealing with frost susceptible soils such as those found across the site. Foundations that are allowed to freeze during the initial construction (before the building is enclosed and heated) may be compromised by the development of ice lenses. Upon thawing, which may take several weeks or months, potential differential settlements could distort the structure causing cracked sheetrock, skewed door frames and broken windows. Therefore, if construction extends into winter months, temporary enclosures and heat should be applied to prevent freezing of the soils located beneath the foundation and floor slab.

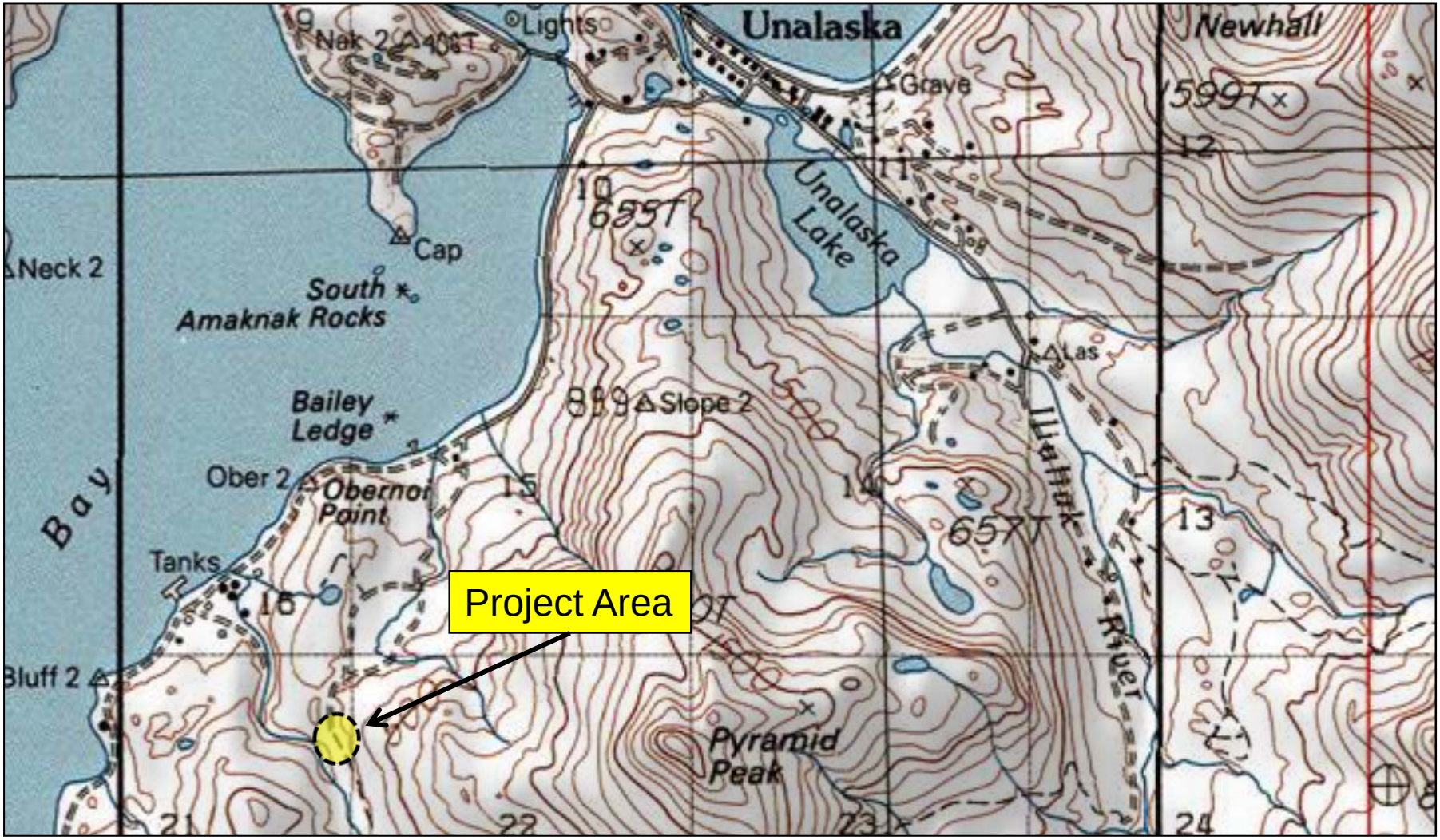
8.0 CLOSURE

Northern Geotechnical Engineering Inc. d.b.a. Terra Firma Testing prepared this report exclusively for the use of *Larsen Consulting Group, Inc.* and their client for use in design of the proposed development. *Northern Geotechnical Engineering Inc. d.b.a. Terra Firma Testing* should be notified if significant changes are to occur in the nature, design, or location of the proposed facilities in order that the conclusions and recommendations presented in this report may be reviewed and, if necessary, modified to satisfy the proposed changes.

Due to the natural variability of earth materials, variations in subsurface conditions across the property may exist other than those identified during the course of the investigation. Therefore, it is recommended that a qualified geotechnical engineer be on-site during construction activities to provide corrective recommendations for any unexpected conditions revealed during construction. Furthermore, the construction budget should allow for any unanticipated conditions that may be encountered during construction activities.

Northern Geotechnical Engineering Inc. d.b.a. Terra Firma Testing conducted this investigation following the standard of care expected of professionals undertaking similar work in the State of Alaska under similar conditions. No warranty expressed or implied is made

FIGURES



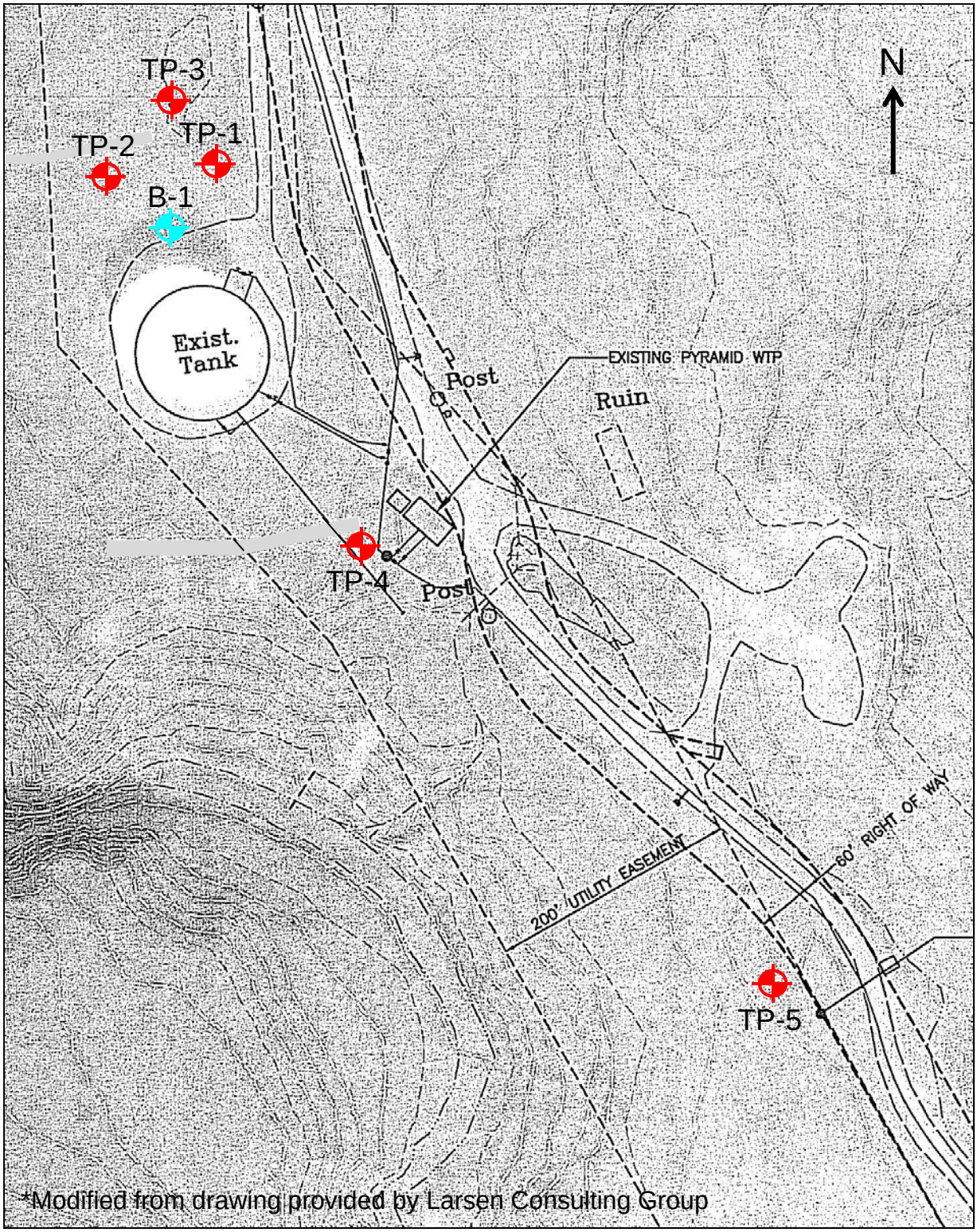
NORTHERN GEOTECHNICAL ENGINEERING INC. TERRA FIRMA TESTING

SITE LOCATION MAP

Pyramid Water Treatment Plant
Unalaska, AK

2417-10

FIG 1



= Approx. Location of Borehole

= Approx. Location Test Pit

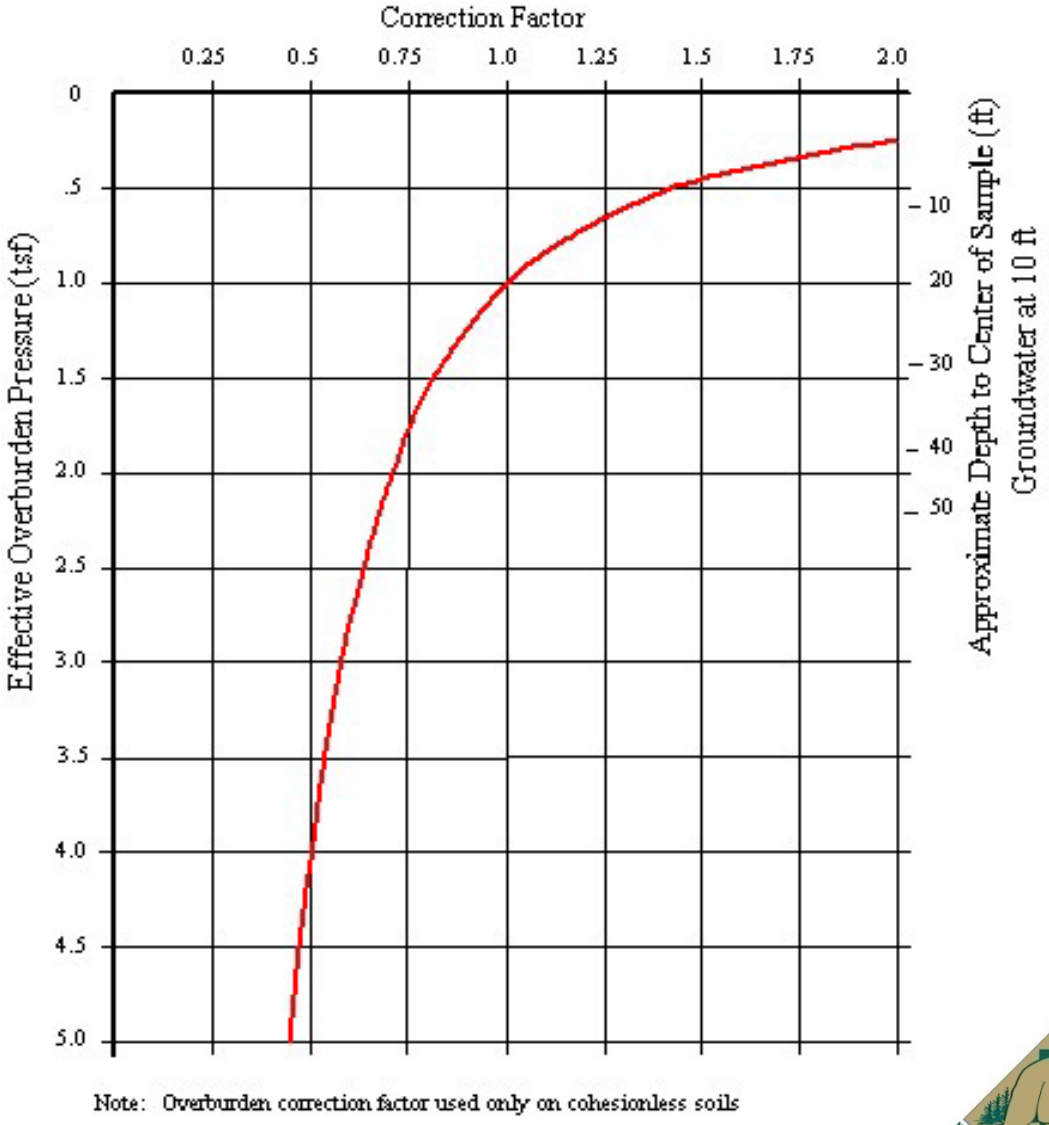
BOREHOLE & TEST PIT LOCATION MAP

Pyramid Water Treatment Plant
Unalaska, AK

2417-10

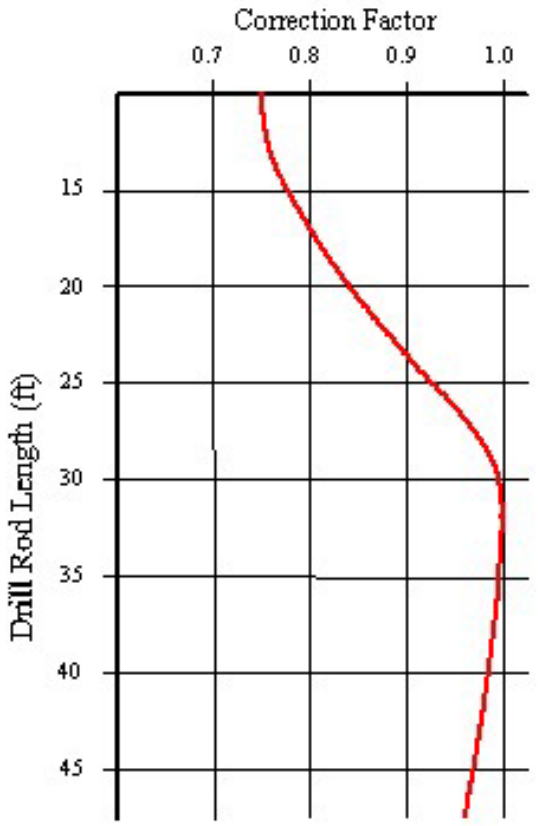
FIG 2

Overburden Pressure Correction



Note: Overburden correction factor used only on cohesionless soils

Rod Length Correction



BLOW COUNT CORRECTIONS

Pyramid Water Treatment Plant
Unalaska, AK

2417-10

FIG 3

APPENDIX A

GRAPHICAL BOREHOLE LOGS

KEY:

- Standard SPT w/ 140# Hammer 30 in. Drop and 2.0” O.D. Sampler.
- Modified SPT w/ 340# Hammer 30 in. Drop and 2.8” O.D. Sampler.
- Grab Sample.
- Shelby Tube Sample.
- Core Sample.
- No Recovery.

bgs Below ground surface

COMPONENT PROPORTIONS

DESCRIPTIVE TERMS	RANGE OF PROPORTION
Trace	1 - 5%
Few	5 - 10%
Little	10 - 20%
Some	20 - 35%
And	35 - 50%

COMPONENT DEFINITIONS

COMPONENT	SIZE RANGE
Boulders	Larger than 12 in
Cobbles	3 in to 12 in
Gravel	3 in to No 4 (4.5mm)
Coarse gravel	3 in to 3/4 in
Fine gravel	3/4 in to No 4 (4.5mm)
Sand	No. 4 (4.5mm) to No. 200 (0.074mm)
Coarse sand	No. 4 (4.5 mm) to No. 10 (2.0 mm)
Medium sand	No. 10 (2.0 mm) to No. 40 (0.42 mm)
Fine sand	No. 40 (0.42 mm) to No. 200 (0.074 mm)
Silt and Clay	Smaller than No. 200 (0.074 mm)

MOISTURE CONTENT

DRY	Absence of moisture, dusty, dry to the touch.
DAMP	Some perceptible moisture; below optimum
MOIST	No visible water; near optimum moisture content
WET	Visible free water, usually soil is below water table.

RELATIVE DENSITY OR CONSISTENCY VERSUS SPT N -VALUE

COHESIONLESS SOILS			COHESIVE SOILS		
Density	“N” value	Approximate Relative Density (%)	Consistency	N (blows/ft)	Approximate Undrained Shear Strength (psf)
Very Loose	0 to 4	0 - 15	Very Soft	0 to 1	< 250
Loose	5 to 10	15 - 35	Soft	2 to 4	250 - 500
Medium Dense	11 to 25	35 - 65	Medium Stiff	5 to 8	500 - 1000
Dense	26 to 50	65 - 85	Stiff	9 to 15	1000 - 2000
Very Dense	over 50	85 - 100	Very Stiff	16 to 30	2000 - 4000
			Hard	over 30	> 4000

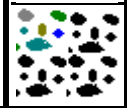
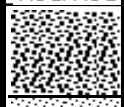
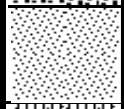
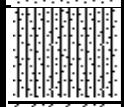
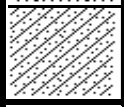
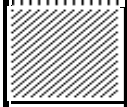
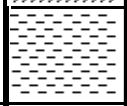
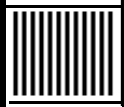
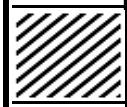
NORTHERN GEOTECHNICAL ENGINEERING, INC. TERRA FIRMA TESTING

BOREHOLE/TEST PIT LOG KEY

Pyramid Water Treatment Plant
Unalaska, AK

2417-10

A-i

MAJOR DIVISION			GRAPHIC SYMBOL	USCS SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL. SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SAND (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 5O		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 5O		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

BOREHOLE/TEST PIT LOG KEY

Pyramid Water Treatment Plant
Unalaska, AK

2417-10

A-ii

FROST GROUP	SOIL TYPE	PERCENTAGE FINER THAN 0.02mm BY WEIGHT	TYPICAL SOIL TYPES UNDER UNIFIED SOIL CLASSIFICATION SYSTEM
NFS*	(a) Gravels Crushed Stone Crushed Rock (b) Sands	0 – 1.5 0 - 3	GW, GP SW, SP
PFS+	(a) Gravels Crushed Stone Crushed Rock (b) Sands	1.5 – 3 3 - 10	GW, GP SW, SP
S1	Gravelly Soils	3 - 6	GW, GP, GW-GM, GP-GM
S2	Sandy Soils	3 - 6	SW, SP, SW-SM, SP-SM
F1	Gravelly Soils	6 - 10	GM, GW-GW,GP-GM
F2	(a) Gravelly Soils (b) Sands	10 – 20 6 - 15	GM, GW-GW,GP-GM SM, SW-SM, SP-SM
F3	(a) Gravelly Soils (b) Sands, Except very fine Silty Sands (c) Clays, PI>12	Over 20 Over 15 - - - - - - -	GM, GC SM, SC CL, CH
F4	(a) All Silts (b) Very Fine Silty Sands (c) Clays, PI>12 (d) Varved Clays and Other Fine Grained Banded Sediments.	- - - - - - - Over 15 -- - - - - - - - - - - - -	ML, MH SM CL, CL-ML CL, CL-ML, CL &ML CL. ML, & SM CL, CH, & ML CL, CH, ML, & SM

*Non-frost susceptible

+Possibly frost susceptible, but requires lab testing to determine frost design soils classification

From: “Seasonal Frost Conditions”, June, 1992, U.S. Army Corps of Engineers TM-5-822-5

USACOE FROST DESIGN SOIL CLASSIFICATION

Pyramid Water Treatment Plant
Unalaska, AK

2417-10

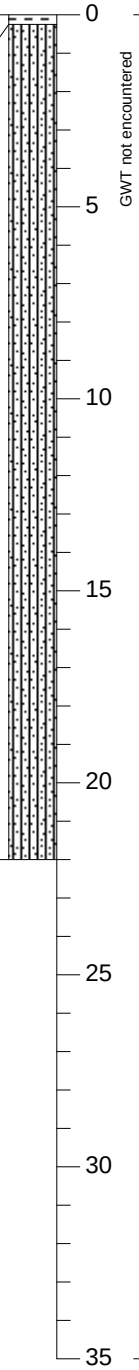
A-iii

Borehole: B-1

Pyramid WTP
Unalaska, Alaska

Drill: Truck-mounted Mobile B-61
Sampling: Modified Split-spoon
Logged By: ACS
Total Depth: 22 ft bgs
Groundwater: Not Encountered

Date Started: 6/24/10
Date Completed: 6/24/10
Elevation: Apx. 6" below tank slab
Project: 2417-10



Description	Sample Type	Field Blows	N-Value SPT	MC (%)	Remarks
Dark brown SAND w/ silt and some organics, damp to wet, soft.					
Medium gray silty SAND w/ gravel, damp, very dense. Glacial till.		*12-28-31*	70	10	P200 = 30%
		13-32-33	65	9	F.C. = F4
		13-30-31	54	10	
		31-41-42	64	9	
		14-26-38	47	10	
		24-50+		8	
Boring completed at depth of 22 feet bgs.					

APPENDIX B

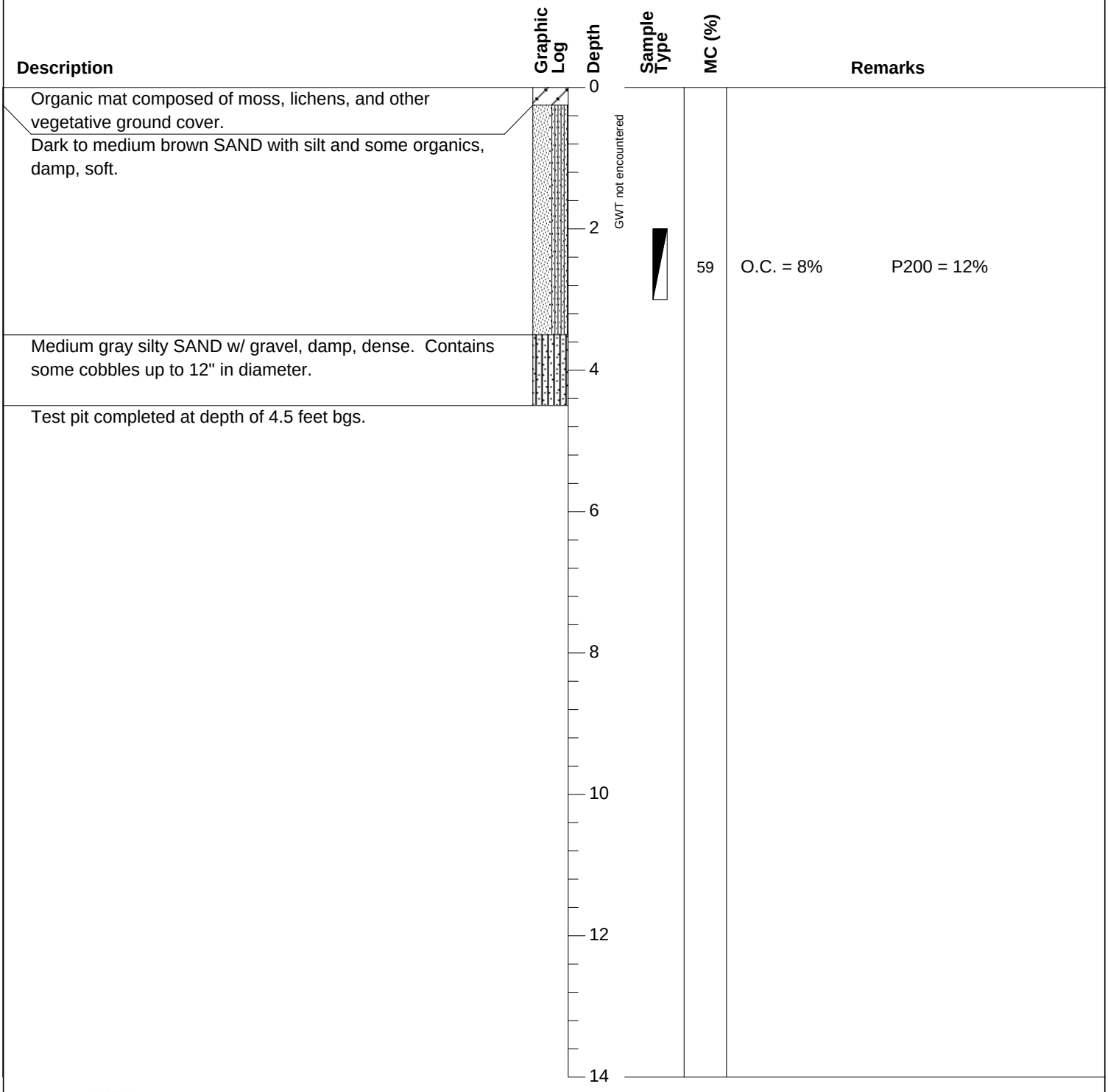
GRAPHICAL TEST PIT LOGS

Test Pit: TP-1

Pyramid WTP
Unalaska, Alaska

Excavator: Deere 75D tracked excavator
Sampling: Grab
Logged By: ACS
Total Depth: 4.5 ft bgs
Groundwater: Not encountered

Date Started: 6/25/10
Date Completed: 6/25/10
Elevation: Apx. 5' above tank slab
Project: 2417-10

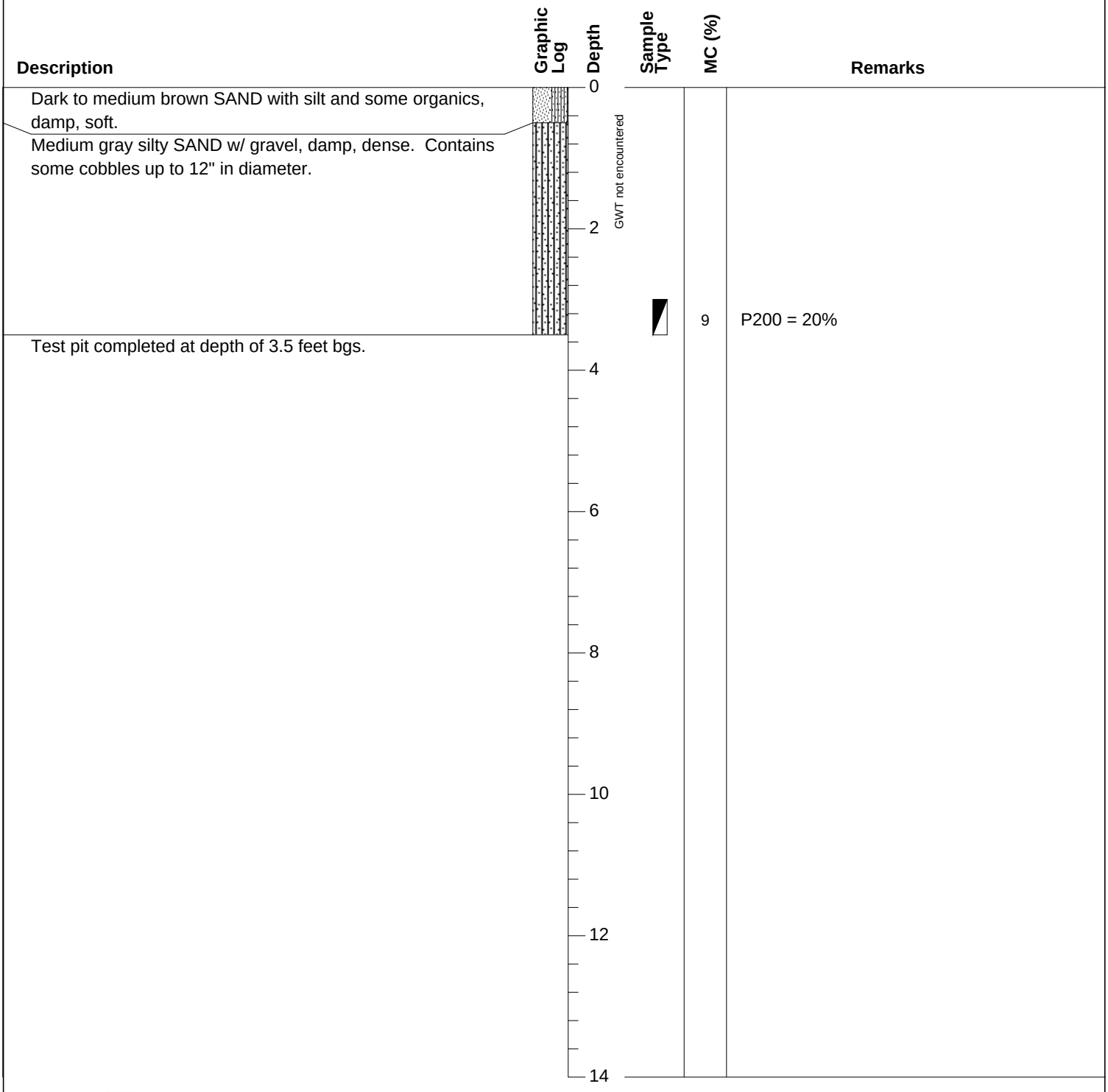


Test Pit: TP-2

Pyramid WTP
Unalaska, Alaska

Excavator: Deere 75D tracked excavator
Sampling: Grab
Logged By: ACS
Total Depth: 3.5 ft bgs
Groundwater: Not encountered

Date Started: 6/25/10
Date Completed: 6/25/10
Elevation: Apx. 5' above tank slab
Project: 2417-10

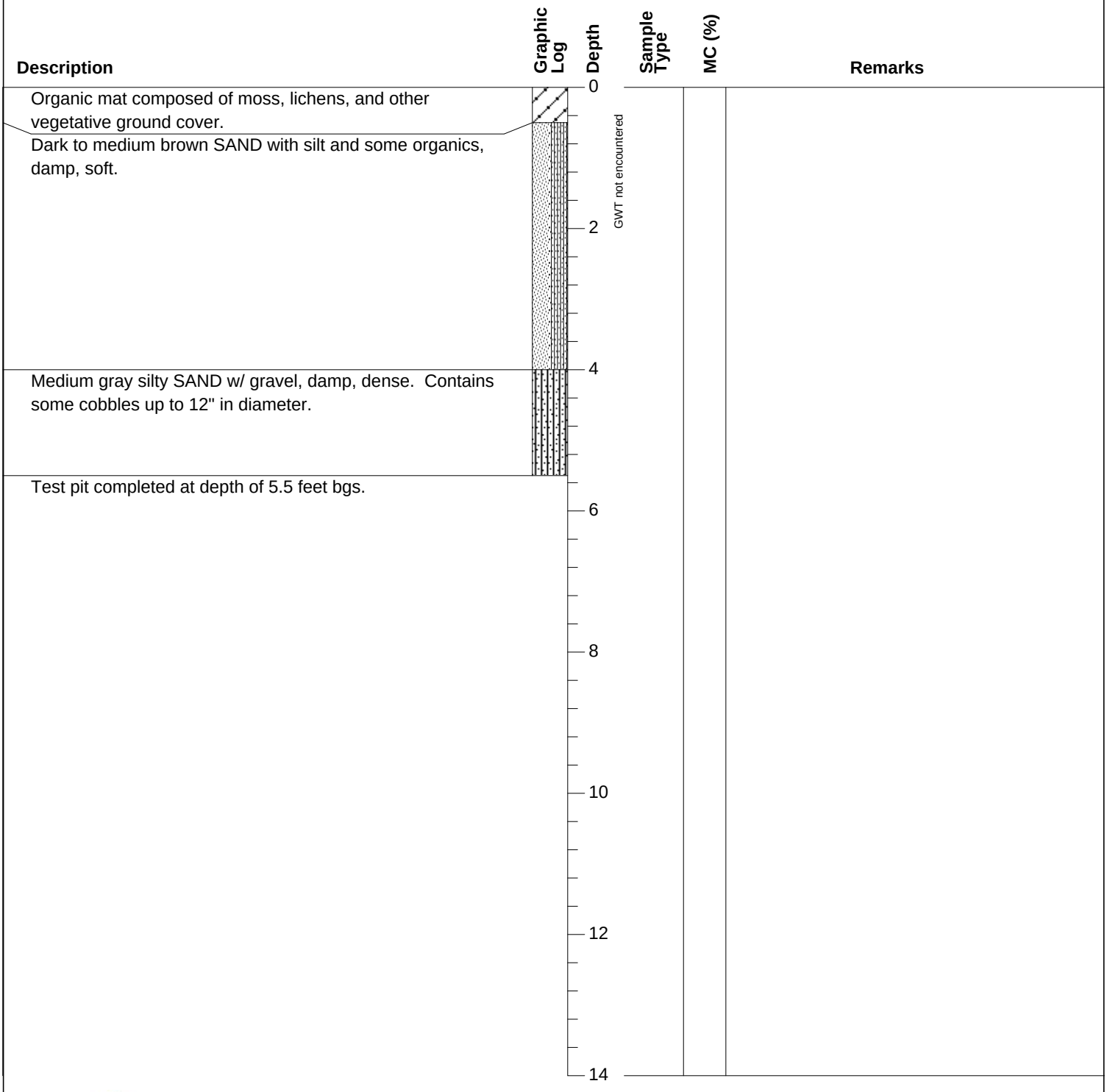


Test Pit: TP-3

Pyramid WTP
Unalaska, Alaska

Excavator: Deere 75D tracked excavator
Sampling: Grab
Logged By: ACS
Total Depth: 5.5 ft bgs
Groundwater: Not encountered

Date Started: 6/25/10
Date Completed: 6/25/10
Elevation: Apx. 2' above tank slab
Project: 2417-10

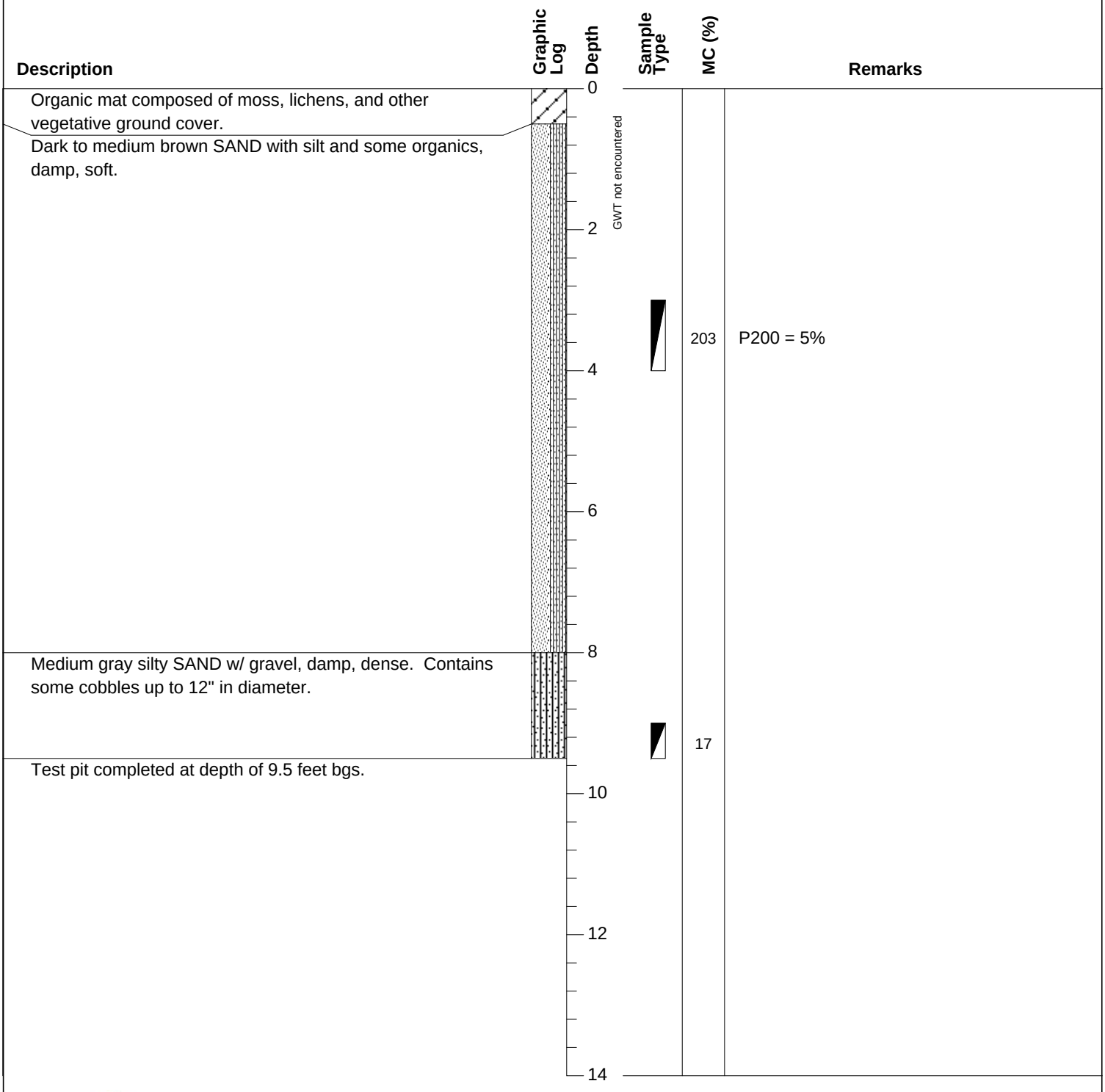


Test Pit: TP-4

Pyramid WTP
Unalaska, Alaska

Excavator: Deere 75D tracked excavator
Sampling: Grab
Logged By: ACS
Total Depth: 9.5 ft bgs
Groundwater: Not encountered

Date Started: 6/25/10
Date Completed: 6/25/10
Elevation: Apx. 7' above WTP slab
Project: 2417-10

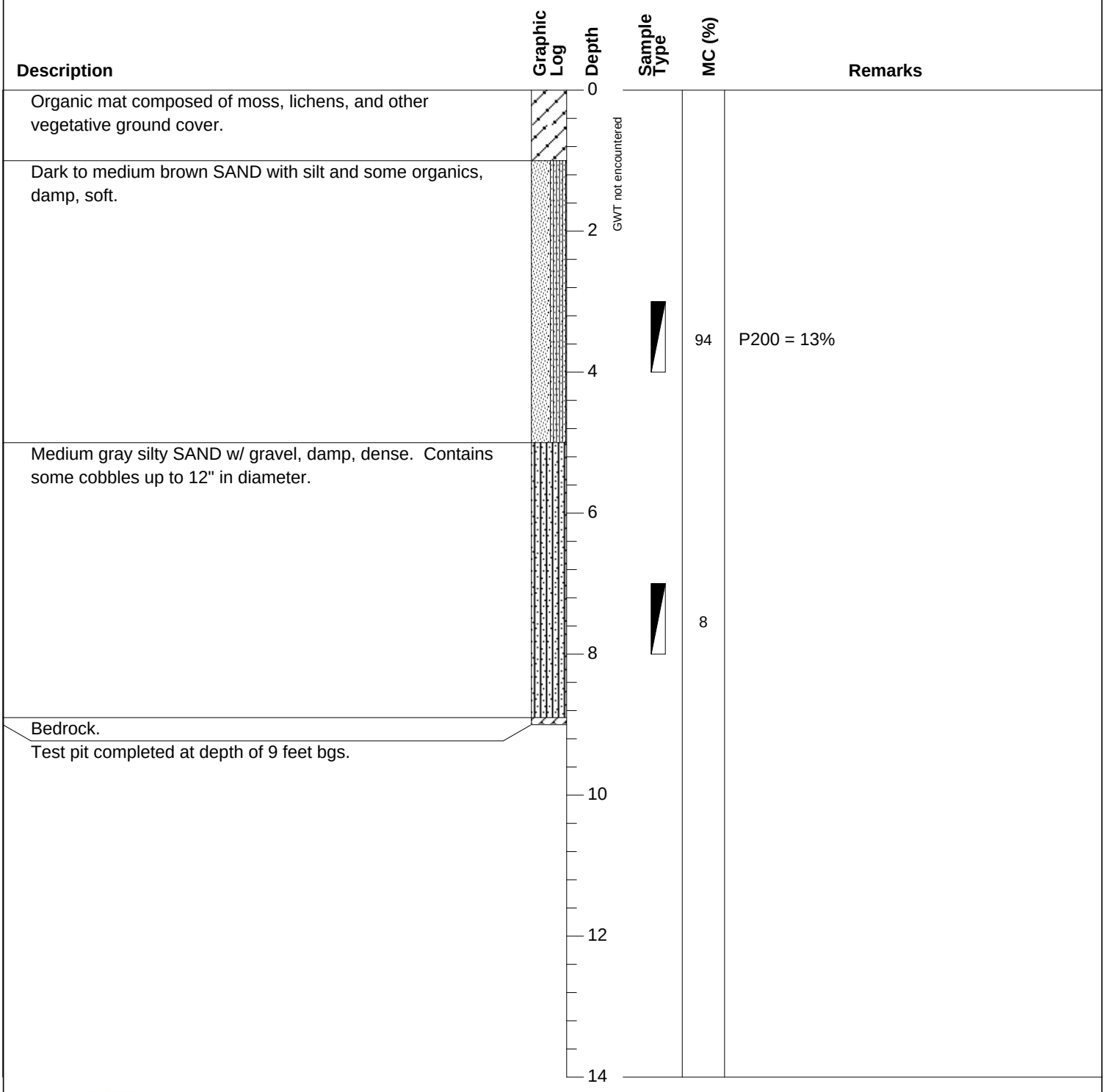


Test Pit: TP-5

Pyramid WTP
Unalaska, Alaska

Excavator: Deere 75D tracked excavator
Sampling: Grab
Logged By: ACS
Total Depth: 9 ft bgs
Groundwater: Not encountered

Date Started: 6/25/10
Date Completed: 6/25/10
Elevation: Apx. 6' above Pyramid Cr. Rd.
Project: 2417-10



APPENDIX C

LABORATORY DATA

Laboratory Data Summary

Pyramid Water Treatment Plant
Unalaska, Alaska
Project 2417-10

Borehole	Sample Depth (ft bgs)		Moisture Content (%)	Organic Content (%)	Grain Size Analysis (%)			Passing .02 mm (%)	Passing #200 Sieve	Frost Class (COE)	Unified Soil Classification
	Top	Bottom			Gravel	Sand	Silt				
B-1	2.5	4.0	10						30		
B-1	5.0	6.5	9		30.0	43.4	26.7	16.5		F4	Silty SAND w/ gravel (SM)
B-1	7.5	9.0	10								
B-1	10.0	11.5	9								
B-1	15.0	16.5	10								
B-1	20.0	21.5	8								
TP-1	2.0	3.0	59	8					12		
TP-2	3.0	4.0	9						20		
TP-4	3.0	4.0	203						5		
TP-4	9.0	9.5	17		15.1	55.7	29.2				Silty SAND w/ gravel (SM)
TP-5	3.0	4.0	94						13		
TP-5	7.0	8.0	8		55.0	35.2	9.9				Poorly graded GRAVEL w/ silt and sand (GP-GM)

11301 Olive Lane
Anchorage, AK 99515

TERRA FIRMA TESTING

Laboratory Testing / Construction Monitoring

Telephone: (907) 344-5934
Fax: (907) 344-5993
www.nge-tft.com

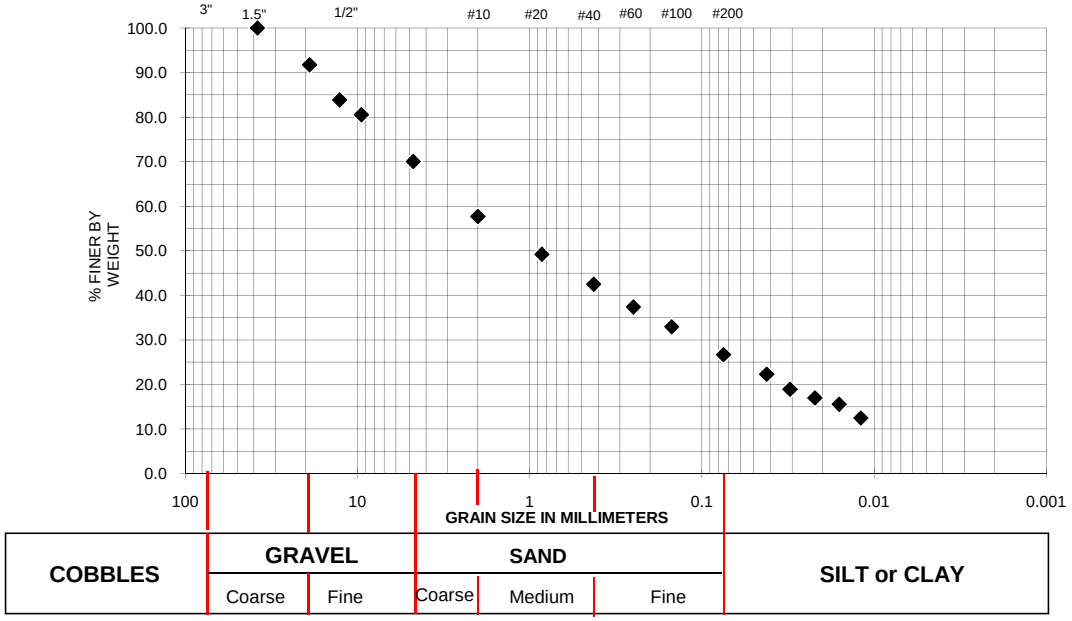
PROJECT CLIENT:	**Larsen Consulting Group**
PROJECT NAME:	**Pyramid WTP**
PROJECT NO.:	**2417-10**
SAMPLE LOCATION:	**B-1**
SAMPLE NO/ DEPTH	**5'-6.5'**
DESCRIPTION:	**Silty sand w/ gravel**
DATE TESTED:	**7/7/2010**
TESTED BY:	**DP**
REVIEWED BY:	**Ron Caron C.E.T.**

% GRAVEL:	**30.0**	USC:	**SM**
% SAND:	**43.4**	FC:	**F4**
% SILT/CLAY:	**26.7**	.02 mm:	**16.5**

ASTM D1557(uncorrected)	pcf
ASTM D4718 (corrected)	pcf
OPTIMUM M.C.% (corrected)	
NATURAL M.C. %	**8.8**

PARTICLE SIZE ANALYSIS

ASTM D422/ C136



SIEVE ANALYSIS RESULT

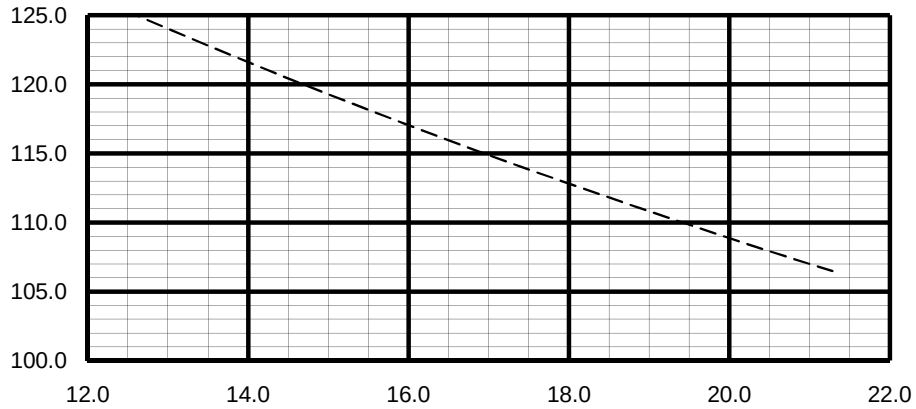
SIEVE SIZE (mm)	SIEVE SIZE (in.)	TOTAL % PASSING	SPEC
152.4	6"		
76.2	3"		
38.1	1.5"	**100**	
19.05	3/4"	**92**	
12.7	1/2"	**84**	
9.5	3/8"	**81**	
4.75	# 4	**70**	
2	#10	**58**	
0.85	#20	**49**	
0.425	#40	**43**	
0.25	# 60	**37**	
0.15	#100	**33**	
0.075	#200	**26.7**	

HYDROMETER RESULT

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1	0.0421	22.3
2	0.0308	18.9
4	0.0221	17.0
8	0.0160	15.6
15	0.0120	12.5
30		
60		
250		
1440		

MOISTURE-DENSITY RELATIONSHIP

ASTM D1557



Perm. (ASTM D2438)	
Degradation (ATM T-13)	
Atterberg Limit ASTM 4318	

The testing services reported herein have been performed to recognized industry standards, unless otherwise noted. No other warranty is made. Should engineering interpretation or opinion be required,

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Anchorage, AK 99515

TERRA FIRMA TESTING

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Fax: (907) 344-5993
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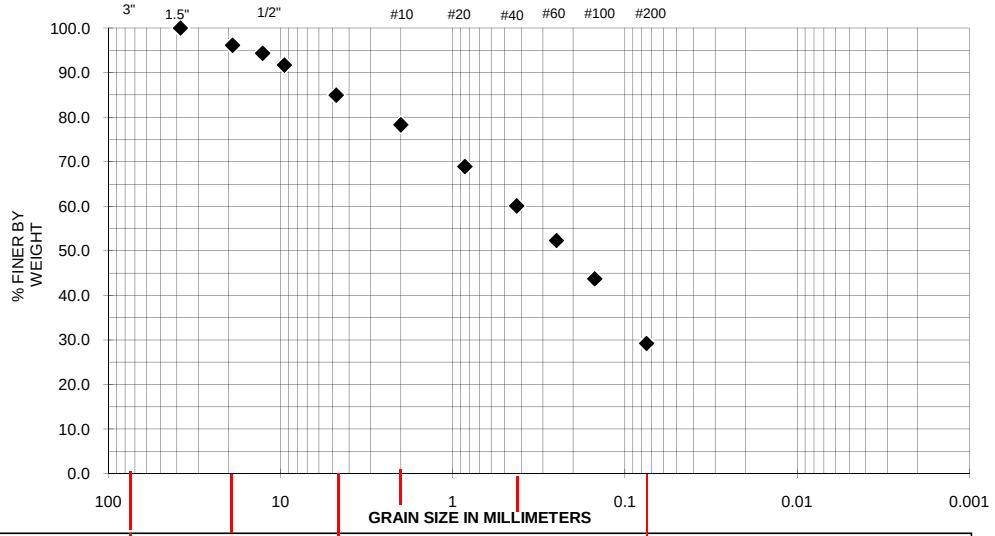
PROJECT CLIENT:	**Larsen Consulting Group**
PROJECT NAME:	**Pyramid WTP**
PROJECT NO.:	**2417-10**
SAMPLE LOCATION:	**TP-4**
SAMPLE NO/ DEPTH	**9'**
DESCRIPTION:	**Silty sand w/ gravel**
DATE TESTED:	**7/7/2010**
TESTED BY:	**DP**
REVIEWED BY:	**Ron Caron C.E.T.**

% GRAVEL:	**15.1**	USC:	**SM**
% SAND:	**55.7**	FC:	
% SILT/CLAY:	**29.2**	.02 mm:	

ASTM D1557(uncorrected)	pcf
ASTM D4718 (corrected)	pcf
OPTIMUM M.C.% (corrected)	
NATURAL M.C. %	**17.0**

PARTICLE SIZE ANALYSIS

ASTM D422/ C136



SIEVE ANALYSIS RESULT

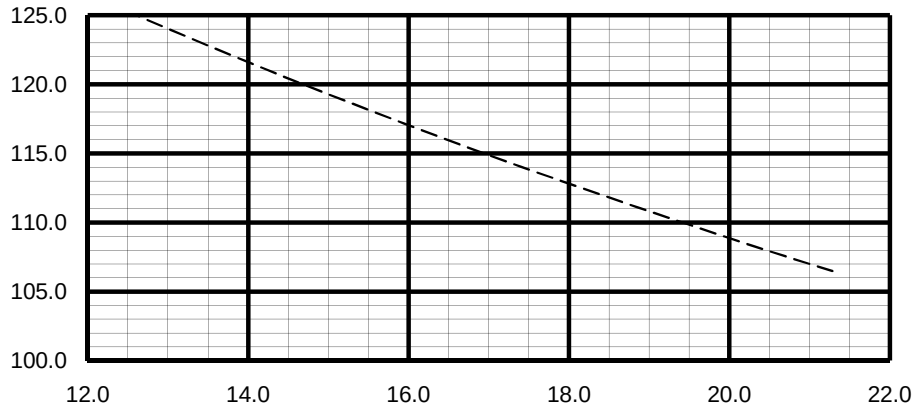
SIEVE SIZE (mm)	SIEVE SIZE (in.)	TOTAL % PASSING	SPEC
152.4	6"		
76.2	3"		
38.1	1.5"	**100**	
19.05	3/4"	**96**	
12.7	1/2"	**94**	
9.5	3/8"	**92**	
4.75	# 4	**85**	
2	#10	**78**	
0.85	#20	**69**	
0.425	#40	**60**	
0.25	# 60	**52**	
0.15	#100	**44**	
0.075	#200	**29.2**	

HYDROMETER RESULT

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
1440		

MOISTURE-DENSITY RELATIONSHIP

ASTM D1557



Perm. (ASTM D2438)	
Degradation (ATM T-13)	
Atterberg Limit ASTM 4318	

The testing services reported herein have been performed to recognized industry standards, unless otherwise noted. No other warranty is made. Should engineering interpretation or opinion be required,

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Anchorage, AK 99515

TERRA FIRMA TESTING

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Fax: (907) 344-5993
www.nge-tft.com

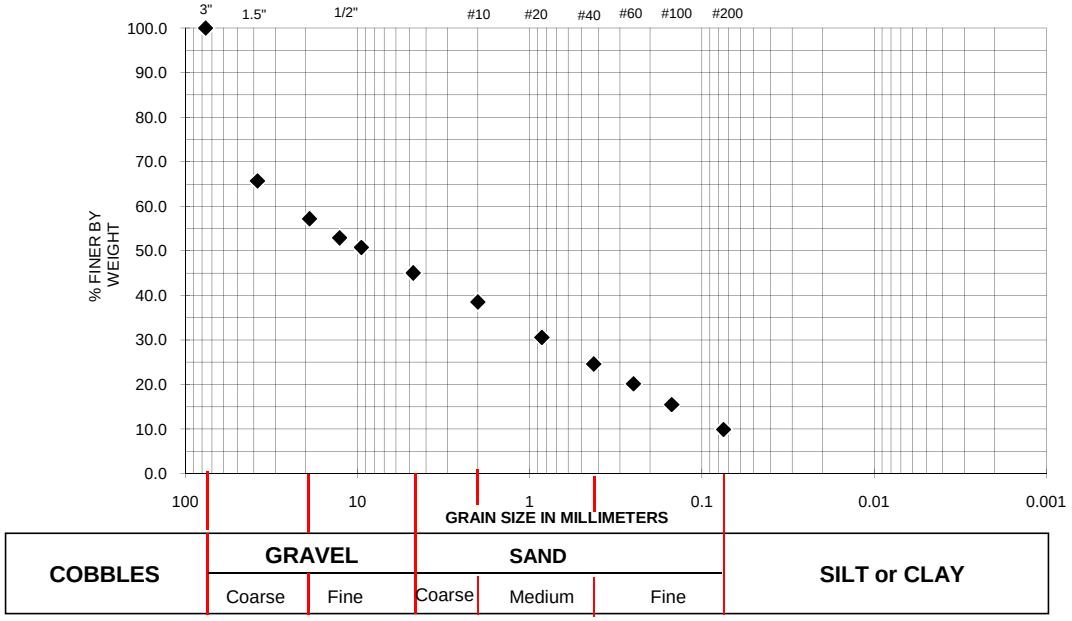
PROJECT CLIENT:	**Larsen Consulting Group**
PROJECT NAME:	**Pyramid WTP**
PROJECT NO.:	**2417-10**
SAMPLE LOCATION:	**TP-5**
SAMPLE NO/ DEPTH	**7'**
DESCRIPTION:	**Poorly grd. gravel w/ silt & sand.**
DATE TESTED:	**7/7/2010**
TESTED BY:	**DP**
REVIEWED BY:	**Ron Caron C.E.T.**

% GRAVEL:	**55.0**	USC:	**GP-GM**
% SAND:	**35.2**	FC:	
% SILT/CLAY:	**9.9**	.02 mm:	

ASTM D1557(uncorrected)	pcf
ASTM D4718 (corrected)	pcf
OPTIMUM M.C.% (corrected)	
NATURAL M.C. %	**8.1**

PARTICLE SIZE ANALYSIS

ASTM D422/ C136



SIEVE ANALYSIS RESULT

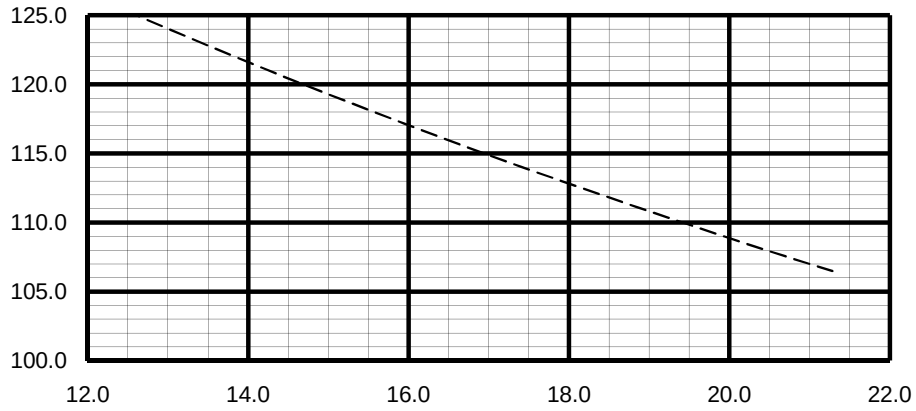
SIEVE SIZE (mm)	SIEVE SIZE (in.)	TOTAL % PASSING	SPEC
152.4	6"		
76.2	3"	**100**	
38.1	1.5"	**66**	
19.05	3/4"	**57**	
12.7	1/2"	**53**	
9.5	3/8"	**51**	
4.75	# 4	**45**	
2	#10	**38**	
0.85	#20	**31**	
0.425	#40	**25**	
0.25	# 60	**20**	
0.15	#100	**15**	
0.075	#200	**9.9**	

HYDROMETER RESULT

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
1440		

MOISTURE-DENSITY RELATIONSHIP

ASTM D1557



Perm. (ASTM D2438)	
Degradation (ATM T-13)	
Atterberg Limit ASTM 4318	

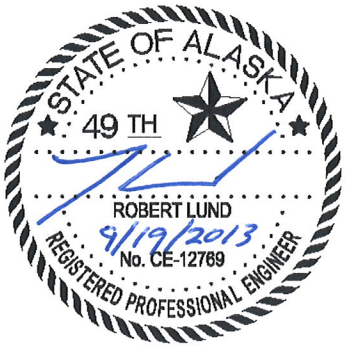
The testing services reported herein have been performed to recognized industry standards, unless otherwise noted. No other warranty is made. Should engineering interpretation or opinion be required,

DATE: SEPTEMBER 19, 2013

TO: LARSEN CONSULTING GROUP INC.

FROM: ROBERT LUND, P.E. CITY OF UNALSAKA

SUBJECT: **PYRAMID WTP TEST PITS**



This memorandum describes the advancement and logging of 8 test pits at the location of the future Unalaska Pyramid Valley Water Treatment Plant on September 15, 2013. The test pits were advanced with a Caterpillar 330C excavator by Bering Shai Construction. The work was contracted, witnessed, and logged by the City of Unalaska.

Locations of the test pits TP-5, TP-6, TP-7, TP-8, TP-9, TP-10 and TP-11 are shown in the attached *Sheet 1 Test Pit Locations*. TP-12 along the future RW line is not shown for clarity. The coordinates given in each *Log of Boring* attached are based on the survey control established in the plans entitled *Pyramid Water Treatment Plant* (the Plans) dated 8/30/2013. A *Photolog* is attached for reference.

Based on observations and measurements of these test pits and the Plans; the over excavation to reach within suitable foundation soils; i.e. glacial till or grey silty sand, is approximately 7-feet below the existing topography.

The information provided herein is based on limited discrete information derived from field measurements; it is only intended to estimate the location and elevation of suitable soil beneath the Site as described by Northern Geotechnical Engineering in 2010. Actual site conditions can and will vary.

REFERENCES

Northern Geotechnical Engineering Inc. *Geotechnical Report for Improvements to the Pyramid Water Treatment Plant Unalaska, Alaska*. July 2010.

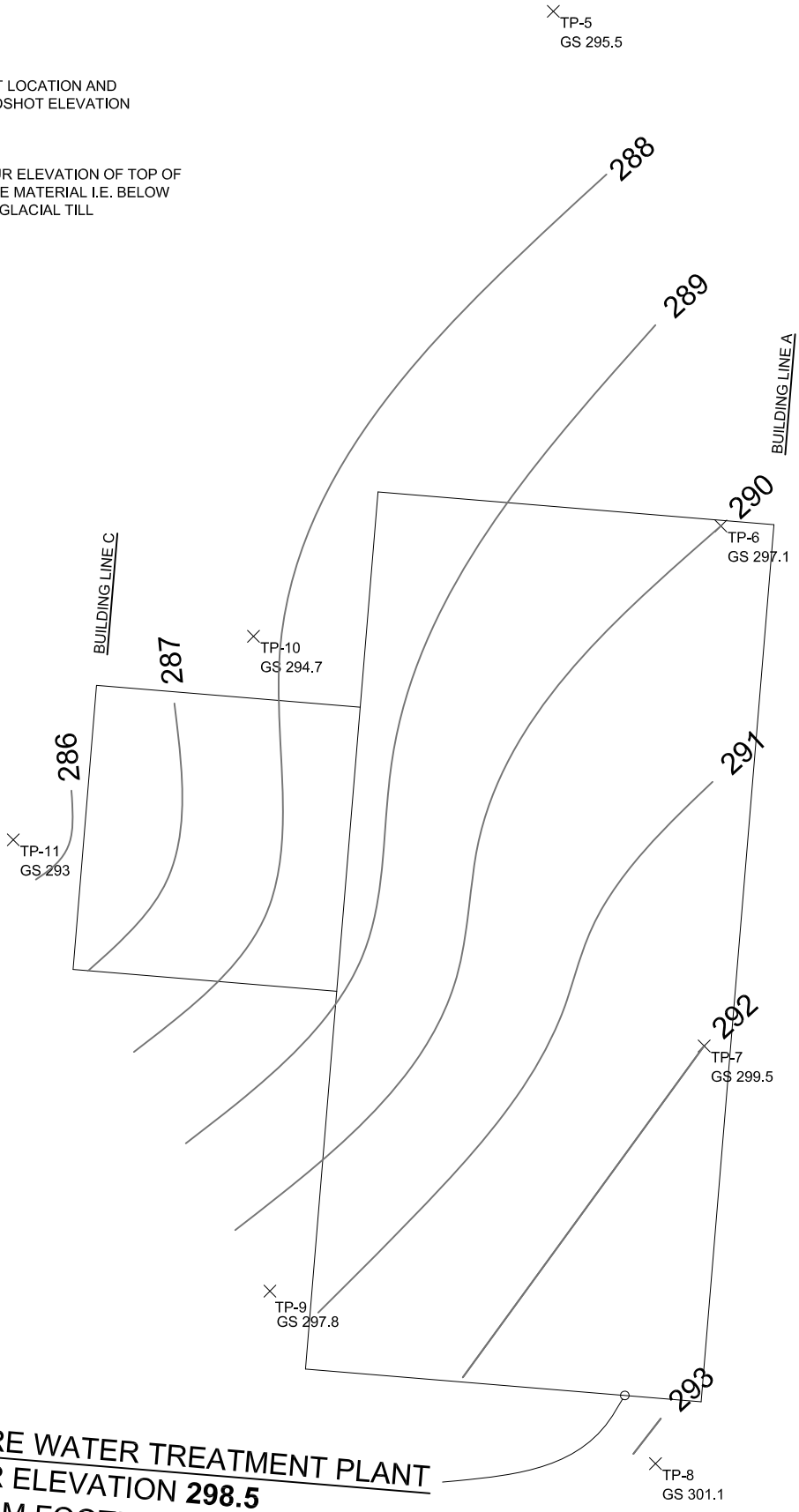
Larsen Consulting Group Inc. *Pyramid Water Treatment Plant Unalaska, Alaska*. August 2013.

SHEET 1 TEST PIT LOCATIONS

KEY:

TP-5 GS 295.5 TEST PIT LOCATION AND GROUNDSHOT ELEVATION

286 CONTOUR ELEVATION OF TOP OF SUITABLE MATERIAL I.E. BELOW TOP OF GLACIAL TILL



FUTURE WATER TREATMENT PLANT
FLOOR ELEVATION **298.5**
BOTTOM FOOTING ELEVATION **295.5**

SHEET 1

TEST PIT LOCATIONS

1" = 16'

LOGS OF BORINGS

Project: Pyramid WTP
Project Location: UNALASKA, AK
Project Number: 08402

Log of Boring TP-5
Sheet 1 of 1

Date(s) Drilled: 9/15/13	Logged By: RL	Checked By:
Drilling Method: Excavator	Drill Bit Size/Type: 3' BUCKET	Total Depth of Borehole: 8.5
Drill Rig Type: CAT 330C	Drilling Contractor: BERING SHAI	Approximate Surface Elevation: 295.5'
Groundwater Level and Date Measured: NONE	Sampling Method(s): VISUAL	Hammer Data:
Borehole Backfill: NATIVE	Location: N1172907.9, E5312542.8	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
295.5	0						ORGANIC MAT	
							BROWN/ORANGE SAND W/ SILT	
288.5	5							
287							MEDIUM GREY SILTY SAND. SOME COBBLES. INCREASING W/ DEPTH. DENSE.	TEST PIT COMPLETED AT 8.5' BGS, REFUSAL
	10							NO GROUNDWATER
	15							
	20							
	25							
	30							

[fieldlog.tpl]

Project: PYRAMID WTP **Project Location:** UNALASKA, AK **Project Number:** DPW 08402	**Log of Boring** TP-6 **Sheet 1 of 1**

Date(s) Drilled	9/15/13	Logged By	RL	Checked By	/
Drilling Method	EXCAVATOR	Drill Bit Size/Type	3' BUCKET	Total Depth of Borehole	8.5'
Drill Rig Type	CAT 330C	Drilling Contractor	BERING SHAI	Approximate Surface Elevation	297.1
Groundwater Level and Date Measured	NONE	Sampling Method(s)	VISUAL	Hammer Data	/
Borehole Backfill	NATIVE	Location	N 1172859.2, E 5312558.7		

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
297.1	0						ORGANIC MAT	
							BROWN/ORANG SAND & SILT	
291.6	5						MEDIUM GREY SILTY SAND, DENSE.	
287.6							MEDIUM GREY SILTY SAND W/ COBBLES. DENSE.	- NO GROUNDWATER - TEST PIT COMPLETED AT 8.5' BGS, REFUSAL
288.6								
	10							
	15							
	20							
	25							
	30							

[fieldlog.rpt]

Project: PYRAMID WTP **Project Location:** UNALASKA, AK **Project Number:**	**Log of Boring** TP-7 **Sheet 1 of 1**

Date(s) Drilled: 9/15/13	Logged By: RL	Checked By:
Drilling Method: EXCAVATOR	Drill Bit Size/Type: 3' BUCKET	Total Depth of Borehole: 10'
Drill Rig Type: CAT 330C	Drilling Contractor: BERING SHAI	Approximate Surface Elevation: 299.5
Groundwater Level and Date Measured: NONE	Sampling Method(s): VISUAL	Hammer Data:
Borehole Backfill: NATIVE	Location: N1172810.1, 5312557.1	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
299.5	0						ORGANIC MAT	
							BROWN/ORANGE SAND w/SILT	
	5							
293.5							MEDIUM GREY SAND & SILT INTERBEDDED w/ ORANGE SAND	
291.5							MEDIUM GRAY SILTY SAND, SOME COBBLES. DENSE.	TEST PIT COMPLETED AT 10', 13:65, REFUSAL. NO GROUNDWATER
289.5	10							
	15							
	20							
	25							
	30							

[fieldlog.tpl]

Project: PYRAMID WTP
Project Location: UNALASKA, AK
Project Number: 08402

Log of Boring TP-8
Sheet 1 of 1

Date(s) Drilled	9/16/13	Logged By	RL	Checked By	
Drilling Method	EXCAVATOR	Drill Bit Size/Type	3' BUCKET	Total Depth of Borehole	10.5'
Drill Rig Type	CAT 330C	Drilling Contractor	BERING SHAI	Approximate Surface Elevation	301.1
Groundwater Level and Date Measured	NONE	Sampling Method(s)	VISUAL	Hammer Data	
Borehole Backfill	NATIVE	Location	N1172770.6, E531262.5		

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
301.1	0						ORGANIC MAT	
							BROWN/ORANGE SAND w/SILT	
294.6	5						MEDIUM GREY SILTY SAND, SOME COBBLES, DENSE.	
290.6	10							-TEST PIT COMPLETED AT 10.5' BGS, REFUSAL.
	15							- NO GROUNDWATER
	20							
	25							
	30							

[fieldlog.tpl]

Project: PYRAMID WTP
Project Location: UNALASKA, AK
Project Number: 08402

Log of Boring TP-9
Sheet 1 of 1

Date(s) Drilled	9/15/13	Logged By	RL	Checked By	/
Drilling Method	EXCAVATOR	Drill Bit Size/Type	3' BOCKET	Total Depth of Borehole	8
Drill Rig Type	CAT 330C	Drilling Contractor	BERING SHAI	Approximate Surface Elevation	297.8
Groundwater Level and Date Measured	NONE	Sampling Method(s)	VISUAL	Hammer Data	/
Borehole Backfill	NATIVE	Location	N 1172 786.9, E 531251 6.1		

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
297.8	0						ORGANIC MAT	
							BROWN SILT AND SAND	
							BROWN/ORANGE SAND & SILT.	
292.3	5						MEDIUM GREY SILTY SAND, DENSE, SOME COBBLES.	
289.8								TEST PIT COMPLETED AT 8' BGS, REFUSAL
	10							NO GROUNDWATER
	15							
	20							
	25							
	30							

[fieldlog.tpl]

Project: PYRAMID WTP
Project Location: UNALASKA, AK
Project Number: 08402

Log of Boring TP-10
Sheet 1 of 1

Date(s) Drilled	9/15/13	Logged By	RL	Checked By	/
Drilling Method	EXCAVATOR	Drill Bit Size/Type	3' BUCKET	Total Depth of Borehole	8'
Drill Rig Type	CAT 330C	Drilling Contractor	BERING SHAI	Approximate Surface Elevation	294.7
Groundwater Level and Date Measured	NONE	Sampling Method(s)	VISUAL	Hammer Data	/
Borehole Backfill	NATIVE	Location	N1172848.8, E5312514.5		

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
294.7	0						ORGANIC MAT	
							BROWN SAND & SILT	
							ORANGE SAND & SILT	
289.2	5						MEDIUM GREY SILTY SAND. SOME COBBLES. DENSE.	TEST PIT COMPLETED AT 8' BGS, REFUSAL
286.7								
	10							NO GROUNDWATER
	15							
	20							
	25							
	30							

[fieldlog.tpl]

Project: PYRAMID WTP **Project Location:** UNALASKA, AK **Project Number:** 08402	**Log of Boring** TP-11 **Sheet 1 of 1**

Date(s) Drilled	9/15/13	Logged By	RL	Checked By	/
Drilling Method	Excavator	Drill Bit Size/Type	3' BUCKET	Total Depth of Borehole	9'
Drill Rig Type	CAT 330C	Drilling Contractor	BERING SHAI	Approximate Surface Elevation	293
Groundwater Level and Date Measured	NONE	Sampling Method(s)	VISUAL	Hammer Data	/
Borehole Backfill	NATIVE	Location	N1172829.6, E531249.8		

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
293	0						ORGANIC SAND & SILT	
							BROWN SAND & SILT	
							ORANGE SAND & SILT	
287	5							
							MEDIUM GRAY SILTY SAND. SOME COBBLES. DENSE.	- TEST PIT COMPLETED AT 8' BGS, REFUSAL
284								- NO GROUNDWATER
	10							
	15							
	20							
	25							
	30							

[fieldlog.tpl]

Project: PYRAMID WTP
Project Location: UNALASKA, AK
Project Number: 08407

Log of Boring TP-12
Sheet 1 of 1

Date(s) Drilled	9/15/13	Logged By	RL	Checked By	/
Drilling Method	EXCAVATOR	Drill Bit Size/Type	3' BUCKET	Total Depth of Borehole	10'
Drill Rig Type	CAT 330C	Drilling Contractor	BERING SHAI	Approximate Surface Elevation	276.9
Groundwater Level and Date Measured	NONE	Sampling Method(s)	VISUAL	Hammer Data	/
Borehole Backfill	NATIVE	Location	N1172558.4, E5312663.9		

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
276.9	0						ORGANIC MAT	
							BROWN SAND W/SILT	
	5						ORANGE SAND W/SILT	
268.9							MEDIUM GREY SILTY SAND. SOME COBBLES, DENSE	- TEST PIT COMPLETED AT 10' BGS, REFUSAL
266.9	10							- NO GROUNDWATER
	15							
	20							
	25							
	30							

[fieldlog.tpl]

PHOTOLOG


CT TANK
TP-8
BLDG LINE A
TP-7
TP-9
BLDG LINE C
TP-6
TP-11
TP-10
TP-5


TP-5
TP-5


TP-6


TP-7


TP-8


TP-9


TP-10


TP-11


TP-12

November 27, 2013 3401-13

Larsen Consulting Group, Inc.
3710 Woodland Drive, Suite 2100
Anchorage, Alaska 99517

Attn: Dale McCoy, P.E.

RE: FIELD EXPLORATION FINDINGS AND RECOMMENDATIONS FOR FOUNDATIONS AND EROSION CONTROL MEASURES FOR THE PYRAMID WATER TREATMENT PLANT DISCHARGE SYSTEM, UNALASKA, ALASKA

Dale,

Northern Geotechnical Engineering, Inc. *d.b.a.* Terra Firma Testing (NGE-TFT) is pleased to present a summary of our finding's during an exploration site visit to the above referenced project site on 9/17/13 as well as recommendations for foundations and erosion control measures. The overall goal of the site visit was to determine the depth to bedrock along the proposed discharge pipe alignment. While this goal was not achieved in its entirety, valuable information regarding the subsurface conditions was obtained.

A 2-in diameter solid stem auger operated by a small, 2-man hand held motor was used to drill through the overburden soils until refusal was met. The near surface soils consisted of saturated, brown/orange silty sand to sandy silt with organics from approximately stations 1+45 to 2+00,. This material is very soft and not suitable for supporting the loads associated with the proposed pipeline. This material ranged in thickness from 4'1" to 5'6". Any foundations required in this area should bear on the underlying glacial till described below.

The augers were damaged while drilling at station 1+75 rendering them inoperable. It was determined that refusal while drilling was due to a layer of glacial till of unknown depth and not bedrock. This glacial till material is exposed at the surface between approximately stations 0+50 to 1+45 and is very dense. Drilling through this material with the equipment available during our site visit was impossible. A shovel and pick axe were used to assess the exposed glacial till. Digging through the glacial till was very difficult with a pick axe and shovel indicating that the material is very dense and capable of supporting the loads associated with the proposed pipeline. This also indicates that excavation of this material, while possible, will be difficult and provisions should be made to provide any specialty equipment required to excavate this material. Near the toe of the slope, surface materials consisted of cobbles and boulders. Excavation will also be difficult in this material and bedrock, while unconfirmed, is expected to be shallower than along the rest of the alignment.

An analysis of the conceptual pipe support foundation design you provided was completed. The foundation depth required to resist lateral seismic loads is 6 feet below ground surface. This depth is based on the assumption that the pipe attachment point is no more than 3 feet above the ground surface measured from the downhill edge of the foundation. A 24" X 24" foundation is sufficient to support the anticipated vertical loads.

Based on the density and historic performance of the native materials, fill slopes using a classified material as steep as 1H:1V are permitted provided erosion control measures are employed. A geo-jute material should be used to minimize surface erosion. It is recommended that a permanent matting be used. An example of an acceptable product is VMAX SC250. This material can be placed directly on the native soils or classified fill without topsoil and hydroseeded and is acceptable for use on slopes of 1H:1V. The placement of the selected matting should follow the manufacturer's recommendations for overlap and peg spacing.

This opportunity to be of service has been appreciated. If you have any questions or concerns or wish to change the scope, please contact us at your convenience.

Sincerely,
Northern Geotechnical Engineering, Inc. *d.b.a.* Terra Firma Testing,

Cody J. Kreitel, E.I.T.
Project Engineer

Keith F. Mobley, P.E.
President

Part 8

APPENDICES

ENVIRONMENTAL PROTECTION AGENCY (EPA) REGION 10
CONTRACT SPECIFICATIONS
August 2012

The EPA Region 10 Contract Specifications pertain to procurement by sealed bids (formally advertised).

The EPA's Contract Specifications are to be included in the EPA grantee/ grant applicant's "Instructions to the Bidders".

A copy of the "Instruction to the Bidders" should be provided to the EPA Project Officer.

Reviews and approvals by EPA are for administrative purposes only to determine compliance with Federal laws and regulations. EPA is not a party to the proposed contract. EPA's reviews and approvals are only to determine Federal grant participation in the proposed contract.

GENERAL. The construction work under this contract is being partially funded by the Environmental Protection Agency (EPA). Therefore, all applicable Federal, state, and local laws are to be complied with during bidding and construction. The contractor is responsible for its own and its employees' acts or omissions under the laws and the contract. The contractor and its subcontractor are jointly and equally responsible for the acts or omissions of the subcontractor and its employees.

EPA grantees and subgrantees are responsible for the successful administration and completion of Federally assisted projects. EPA is not a party to any of the grantee's and/or subgrantees' subagreements for the construction of the proposed project. Reviews and approvals by EPA are for administrative purposes only to determine compliance with Federal laws and regulations and to determine the level of Federal participation.

COMPLIANCE WITH STATE & LOCAL LAWS. The construction of the project, including the letting of subcontracts, shall conform to the requirements of state and local laws and ordinances. If such requirements conflict with Federal laws and regulations, Federal laws and regulations shall prevail (e.g., retention of records).

MAINTENANCE OF EXISTING TREATMENT WORKS DURING CONSTRUCTION. Where construction consists of replacement of, or modification to, existing lines, pump stations or treatment facilities, the contractor shall provide for maintaining such works and existing levels of treatment at all times during construction. The work shall be done in accordance with state and local regulations.

ACCESS TO CONSTRUCTION SITE. The contractor shall provide access to all work sites for duly authorized representatives from EPA and the state.

ACCESS TO RECORDS. The contractor shall provide for access for duly authorized representatives from EPA and state to any books, documents, papers, and records of the

contractor which are pertinent to that specific contract for the purpose of conducting audits, examinations, excerpts, and transcriptions.

RECORDS RETENTION. The grantee, subgrantees, and prime contractors shall retain all records for three years after final payments or other pending matters (e.g., litigation and audit) are closed, whichever is longer.

BONDING REQUIREMENTS. Bidders on contracts less than $100,000 shall be subject to state and local requirements relating to bid guarantees and bonding requirements.

For contracts and subcontracts exceeding $100,000, EPA may accept the bonding policy and requirements of the grantee or subgrantee if EPA made a determination that its interest is adequately protected. If such a determination has not been made, each contractor awarded a construction contract in excess of $100,000 shall meet the minimum requirements as follows:

- Bid Guarantee from each bidder equivalent to five percent of the bid price.
- Performance and Payment Bond on part of the contractor for 100 percent of the contract price.

AWARDING OF SUBAGREEMENTS. For sealed bids and where two or more responsible bidders are willing and able to compete effectively, grantees or subgrantees will make awards to the lowest, responsive, responsible bidder whose bid conforms with all the material, terms and conditions of the invitation for bids. In instances where competition by sealed bids is determined inadequate (e.g., only one sealed bid is received), the grantee or subgrantee must obtain EPA approval prior to executing noncompetitive procurement contracts. Otherwise, EPA funding of the project may be withdrawn.

SETTLEMENT OF PROCUREMENT ISSUES. Grantees and subgrantees alone will be responsible for the settlement of all contracts and administrative issues arising out of procurement. Grantees and subgrantees will have procedures to handle and resolve procurement issues and shall disclose information regarding such issues to EPA. Such issues include, but are not limited to, source evaluation, bid protests, disputes, and claims.

EPA is not a party to any of the grantee's or subgrantee's subagreements for the construction of the proposed project. EPA's funding of this project does not relieve the grantee or subgrantee of any contractual responsibilities under its contracts. Reviews and approvals by EPA are for administrative purposes only to determine compliance with Federal laws and regulations and to determine the level of Federal participation.

EPA will not substitute its judgment for that of the grantee or subgrantee unless the matter is primarily a Federal concern. Violations of law will be referred to the local, state, or Federal authority having jurisdiction. Reviews by EPA will be limited to the violations specified below. All other issues received by EPA will be referred to the grantee or subgrantee.

- Violations of Federal law or regulations or the standards. Violations of State or local law will be under the jurisdiction of state or local authorities; and
- Violations of the grantee's or subgrantee's protest procedures for failure to review a complaint or protest.

BID PROTESTS. Grantees and subgrantees will have procedures to resolve bid protest appeals and shall disclose information regarding the protest to EPA and the state. A protestor must exhaust all administrative remedies at the grantee's and subgrantee's level before pursuing a protest with EPA.

Only parties with a financial interest which are adversely affected by the grantee's or subgrantee's decision on the initial bid protest may file a bid protest appeal with EPA. **EPA will not substitute its judgment for the grantee or subgrantee unless the matter is primarily a Federal concern.** Reviews by EPA will be limited to the violations described under the preceding section entitled "Settlement of Procurement Issues". Violations of law will be referred to the appropriate local or state authority.

Bid protest appeals must be filed with the Office of Regional Counsel, EPA Region 10, ORC-158, EPA, Region 10, 1200 Sixth Avenue, Seattle, WA 98101. A protest appeal must:

- Be a written complaint regarding the grantee's or subgrantee's determination of a bid protest appeal;
- Include a copy of the grantee's or subgrantee's determination of the protest, and
- State the basis for the appeal.

The party filing the bid protest appeal must concurrently transmit a copy of all protest documents and any attachments to all other financially interested parties which may be adversely affected by the determination of the protest appeal.

EPA will only consider written protest appeals received by the Office of Regional Counsel (ORC) **within seven (7) calendar days** of the grantee's decision. However, the adversely affected party can also meet the seven day notice requirements by telegraphing or faxing to ORC within the seven calendar day period its intent to file a protest appeal, provided the adversely affected party submits a complete protest appeal within seven (7) calendar days of the date it sent the telegram or fax. If the seventh day falls on a Saturday, Sunday, or holiday, the next working day shall be the last day to submit a protest appeal.

For any protest appeal based upon alleged improprieties in the solicitation which were clearly apparent before receipt of initial proposals, EPA may dismiss as untimely any such appeals if the grantee or subgrantee does not receive the initial protest before bid opening or the closing date for receipt of proposals.

COST AND PRICE ANALYSIS. The grantee and subgrantee must perform a cost or price analysis for all procurement actions to determine the reasonableness of the proposed contract price. A cost analysis is also necessary for contract modifications, and for change orders. The method and degree of analysis is dependent on the facts surrounding the particular procurement situation, but as a starting point, grantees must make independent estimates before receiving bids or proposals.

COMPLIANCE WITH OTHER FEDERAL REGULATIONS. The grantee and subgrantee are to ensure that their contracts include appropriate provisions in their bid documents to ensure contractors' compliance with the following:

- Administrative, contractual or legal remedies in instances where contractors violate or breach contract terms, and provide sanctions and penalties.

- Termination for cause or convenience by the grantee and subgrantee including the manner by which it will be effected and the basis for settlement.
- Compliance with Executive Orders and Department of Labor pertaining to Equal Employment Opportunity. (Pertains to all construction contracts in excess of $10,000.)
- Compliance with the Copeland Anti-Kickback Act.
- Compliance with sections 103 and 107 of the Contract Work Hours and Safety Standards Act. (Pertains to construction contracts in excess of $2,000 and in excess of $2,500 for contracts involving employment of mechanics or laborers.)
- Compliance with all applicable standards, orders, or requirements under 306 of the Clean Air Act, section 508 of the Clean Water Act, Executive Order 11738 and EPA regulations 40 CFR, Part 15. (Pertains to contracts and subcontracts in excess of $100,000.)
- Requirements of the energy efficiency contained in the state energy conservation plan issued under the Energy Policy and Conservation Act. P.L. 94-163.

EPA REGULATORY REFERENCES. 40 CFR Part 31. In circumstances where the provisions of Part 31 are ambiguous EPA will generally look for guidance to the language of 40 CFR Part 33 and past requirements and determinations made pursuant to Part 33.

SMALL, MINORITY AND WOMEN BUSINESS ENTERPRISE UTILIZATION REQUIREMENTS AND EQUAL EMPLOYMENT OPPORTUNITY REQUIREMENTS

POLICY

Consistent with the President's Policy Statement on Minority Business Enterprise dated December 17, 1983, Executive Order 12432 and the Environmental Protection Agency's Procurement Under Assistance Agreements Regulation (40 CFR 33) dated May 28, 2008, all bidders shall be required to comply fully with these bid specifications toward the goal of equitable utilization of Minority Business Enterprises (MBE), Women Business Enterprises (WBE), and Small Business Enterprises (SBEs).

Such utilization may be through prime contracting, subcontracting, joint-venture, procurement of supplies, material or equipment, or other business participation utilized in performing this project. In this regard all contractors shall take all necessary and reasonable steps to ensure MBE/WBE/SBEs have the maximum opportunity to compete for and/or perform contracts. Contractors shall not discriminate on the basis of race, color, national origin, or sex in the award and performance of EPA assisted projects.

REQUIREMENTS

Bidders must take the following “Good Faith Efforts” in awarding subcontracts for supplies, construction or services and equipment:

1. Ensure DBEs are made aware of contracting opportunities to the fullest extent practicable through outreach and recruitment activities. For Indian Tribal, State and Local and Government recipients, this will include placing DBEs on solicitation lists and soliciting them whenever they are potential sources.
2. Make information on forthcoming opportunities available to DBEs and arrange time frames for contracts and establish delivery schedules, where the requirements permit, in a way that encourages and facilitates participation by DBEs in the competitive process.

This includes, whenever possible, posting solicitations for bids or proposals for a minimum of 30 calendar days before the bid or proposal closing date.

3. Consider in the contracting process whether firms competing for large contracts could subcontract with DBEs. For Indian Tribal, State and local Government recipients, this will include dividing total requirements when economically feasible into smaller tasks or quantities to permit maximum participation by DBEs in the competitive process.
4. Encourage contracting with a consortium of DBEs when a contract is too large for one of these firms to handle individually.
5. Use the services and assistance of the SBA and the Minority Business Development Agency of the Department of Commerce.
6. If the prime contractor awards subcontracts, require the prime contractor to take the above steps.

The bidder shall complete a Sworn Statement of Compliance (Attachment B) which has been made a part of the proposal.

FAIR SHARE

Fair Share is a reasonable amount of funds commensurate with the total project funding, demographic factors and the availability of minority and women's businesses. A fair share does not constitute an absolute goal, but a commitment on the part of the bidder to attempt to use minority and women's businesses by carrying out the five "Good Faith Efforts" described under 40 CFR 33 Subpart C.

40 CFR 33 Subpart B 33.201. Certification: (a) In order to qualify and participate as an MBE or WBE prime or subcontractor for EPA recipients under EPA's DBE Program, an entity must be properly certified as required by this subpart.

EPA AND STATE OF ALASKA FAIR SHARE MBE AND WBE GOALS

The established goals for MBE and WBE participation are as follows:

Construction	4.58% MBE	2.04% WBE
Supplies	2.06% MBE	1.29% WBE
Services	3.22% MBE	2.54% WBE

Additional information may be found at website http://www.epa.gov/osdbu/grants.htm. Questions about DBE regulations should be directed to the owner.

EPA Review of the Apparent Low Bid

1. The EPA grantee / grant applicant (Grantee) shall define what information must be submitted completely and correctly with the sealed bid and what information may be submitted, adjusted, or corrected after bid opening based on state and local requirements.

2. The Grantee shall evaluate the bid packages to identify the lowest responsive, responsible bidder (preferred bidder) and forward the documentation listed below (Submittals 1-9) to the EPA DBE Coordinator and the EPA Project Officer.

3. EPA will then review the apparent low bidder's good faith efforts and compliance with the Federal Disadvantaged Business Enterprises (DBE) and the Small, Women, and Minority Business Enterprises (MBE/WBE) requirements. EPA's review for compliance with the Federal DBE requirements is a "responsibility" matter.

4. EPA's review is normally completed within 3 - 4 weeks. EPA may require that the apparent low bidder demonstrate additional good faith efforts. Failure to demonstrate good faith efforts (i.e., non compliance with the Federal DBE requirements) will preclude EPA from approving Federal grant participation in the proposed contract.

5. If the Grantee proceeds with award of the low bidder contract prior to receipt of the EPA Project Officer's approval, the Grantee proceeds at its own risk (e.g., contract costs may not be eligible for grant participation).

SUBMITTALS

Grantee to prepare and submit:

(1) BID TABULATION	Summary of Submitted Bid Forms
(2) EPLS RESULTS	Firm not suspended or debarred (see grant condition)

Grantee to submit from the apparent low bidder:

(3) APPARENT LOW BID	Copy of Submitted Bid Form Copy of Bid Bond
(4) APPENDIX A	Small, Women and Minority Business Firms Contacted
(5) APPENDIX B	Sworn Statement of Compliance with Small, Women and Minority Business Utilization Requirements
(6) EPA FORM 6100-3	DBE Subcontractor Performance Form
(7) EPA FORM 6100-4	DBE Subcontractor Utilization Form
(8) APPENDIX C	Contractor's Compliance Statement (Executive Order #11246)
(9) APPENDIX D	Certification of Non-Segregated Facilities

Copies of items (4) through (9) follow this page.

APPENDIX A

SMALL, WOMEN, AND MINORITY BUSINESS ENTERPRISES CONTACTED

Project: ____

Name of Bidder: ____

(Complete for each DBE firm contacted) Check all that apply:

Name of Firm: ____________________________	___ MBE
Address: ________________________________	___ SBE
Phone: __________________________________	___ WBE
Description of Work Element or Supplies Requested:	___ Joint Venture ___%
______________________________________	___ Other
Date and Time contacted: __________________	___ Subcontractor
Amount to be contracted: $ ________________ **OR**	___ Supplier
Reason not selected: _______________________	___ Manufacturer

Name of Firm: ____________________________	___ MBE
Address: ________________________________	___ SBE
Phone: __________________________________	___ WBE
Description of Work Element or Supplies Requested:	___ Joint Venture ___%
______________________________________	___ Other
Date and Time contacted: __________________	___ Subcontractor
Amount to be contracted: $ ________________ **OR**	___ Supplier
Reason not selected: _______________________	___ Manufacturer

Name of Firm: ____________________________	___ MBE
Address: ________________________________	___ SBE
Phone: __________________________________	___ WBE
Description of Work Element or Supplies Requested:	___ Joint Venture ___%
______________________________________	___ Other
Date and Time contacted: __________________	___ Subcontractor
Amount to be contracted: $ ________________ **OR**	___ Supplier
Reason not selected: _______________________	___ Manufacturer

Use as many pages as necessary

APPENDIX B

SWORN STATEMENT OF COMPLIANCE WITH SMALL WOMEN AND MINORITY BUSINESS UTILIZATION REQUIREMENTS

To be eligible for award of this contract, each bidder must execute, and submit, as part of their proposal, and together with their bid, the following certification relating to SBE/WBE/MBE participation. The certification below shall be deemed a part of the resulting contract.

The bidder has taken the following "Good Faith Efforts" in awarding subcontracts:

1. Ensure DBEs are made aware of contracting opportunities to the fullest extent practicable through outreach and recruitment activities. For Indian Tribal, State and Local and Government recipients, this will include placing DBEs on solicitation lists and soliciting them whenever they are potential sources.

2. Make information on forthcoming opportunities available to DBEs and arrange time frames for contracts and establish delivery schedules, where the requirements permit, in a way that encourages and facilitates participation by DBEs in the competitive process. This includes, whenever possible, posting solicitations for bids or proposals for a minimum of 30 calendar days before the bid or proposal closing date.

3. Consider in the contracting process whether firms competing for large contracts could subcontract with DBEs. For Indian Tribal, State and local Government recipients, this will include dividing total requirements when economically feasible into smaller tasks or quantities to permit maximum participation by DBEs in the competitive process.

4. Encourage contracting with a consortium of DBEs when a contract is too large for one of these firms to handle individually.

5. Use the services and assistance of the SBA and the Minority Business Development Agency of the Department of Commerce.

6. If the prime contractor awards subcontracts, require the prime contractor to take the above steps.

_____ _____

Signature Date

_____

Name and title of signer (please type)

_____

Email address

OMB Control No: _____
Approved: _____
Approval Expires: _____

Environmental
Protection Agency

Disadvantaged Business Enterprise Program
DBE Subcontractor Performance Form

NAME OF SUBCONTRACTOR[1]	PROJECT NAME
ADDRESS	BID/PROPOSAL NO.
TELEPHONE NO.	E-MAIL ADDRESS
PRIME CONTRACTOR NAME	

CONTRACT ITEM NO.	ITEM OF WORK OR DESCRIPTION OF SERVICES BID TO PRIME	PRICE OF WORK SUBMITTED TO PRIME CONTRACTOR

Currently certified as an MBE or WBE under EPA's DBE Program? _____ Yes _____ No

_____ _____
Signature of Prime Contractor Date

_____ _____
Print Name Title

_____ _____
Signature of Subcontractor Date

_____ _____
Print Name Title

[1]Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

OMB Control No: _____
Approved: _____
Approval Expires: _____

Environmental
Protection Agency

Disadvantaged Business Enterprise Program
DBE Subcontractor Utilization Form

BID/PROPOSAL NO.	PROJECT NAME
NAME OF PRIME BIDDER/PROPOSER	E-MAIL ADDRESS
ADDRESS	
TELEPHONE NO.	FAX NO.

The following subcontractors[1] will be used on this project:

COMPANY NAME, ADDRESS, PHONE NUMBER, AND E-MAIL ADDRESS	TYPE OF WORK TO BE PERFORMED	ESTIMATED DOLLAR AMOUNT	CURRENTLY CERTIFIED AS AN MBE OR WBE?

I certify under penalty of perjury that the forgoing statements are true and correct. In the event of a replacement of a subcontractor, I will adhere to the replacement requirements set forth in 40 CFR Part 33 Section 33.302(c).

Signature Of Prime Contractor _____ Date _____

Print Name _____ Title _____

[1]Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

U.S. Environmental Protection Agency

APPENDIX C

CONTRACTOR'S COMPLIANCE STATEMENT (EXECUTIVE ORDER #11246)

Date _____

This statement relates to a proposed contract with_____

_____
(Name of grantee)

who expects to finance the contract with assistance from the Environmental Protection Agency. I am the undersigned bidder or prospective contractor. I represent that:

I have _____ I have not ____ participated in a previous contract or subcontract subject to Executive Order 11246 of September 24, 1965 (regarding equal employment opportunity) or a preceding similar Executive Order. I agree to comply with all the provisions of this Executive Order and the rules, regulations and relevant orders of the Secretary of Labor. (60-1.4(b)(4))

_____ _____
Signature Date

_____
Name and title of signer (please type)

U.S. Environmental Protection Agency

APPENDIX D

CERTIFICATION OF NONSEGREGATED FACILITIES

(Applicable to federally assisted construction contracts and related subcontracts exceeding $10,000 which are not exempt from the Equal Opportunity clause.)

The federally assisted construction contractor certifies that he does not maintain or provide for his employees any segregated facilities at any of his establishments, and that he does not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The federally assisted construction contractor certified, further that he will not maintain or provide for his employees any segregated facilities at any of his establishments, and that he will not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The federally assisted construction contractor agrees that a breach of this certification is a violation of the Equal Opportunity clause in this contract.

As used in this certification, the term "segregated facilities" means any waiting rooms, work area, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or area, in fact, segregated on the basis of race, creed, color, or national origin, because of habit, local custom, or otherwise. The federally assisted construction contractor agrees that (except where he has obtained identical certifications from proposed contractors for specific time periods) he will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity clause, and that he will retain such, certification in this file.

_____ _____

Signature Date

_____

Name and title of signer (please type)

OTHER FORMS AND ACTIONS NOT REQUIRED BEFORE AWARD OF CONTRACT

To ensure the work performed under the contract remains eligible for EPA grant participation, after the contract is awarded and executed the successful bidder shall take action on the following documents. A summary of action required by the documents is provided for reference only. Refer to the actual documents for all requirements that must be fulfilled.

EPA FORM 6100-2	DBE Subcontractor Participation Form (Provide form to all DBE subcontractors)
APPENDIX E	Notice to Labor Unions or Other Organization of Workers Non-Discrimination in Employment (Complete the form and post as instructed.)
APPENDIX F	Standard Form 100 (EEO-1) (Submit the form, as required, to the listed address unless a report has been filed within 12 months preceding the contract award date. The EEO-1 report shall be submitted annually during the life of the project.)
APPENDIX G	Requirements for Affirmative Action to Ensure Equal Employment Opportunity (Executive Order 11246) (Comply with Executive Order 11246)
APPENDIX H	Equal Opportunity Clause (Include the EEO clause in the construction contract and subcontracts and comply with requirements.)
APPENDIX I	Affirmative Action Program (Comply with affirmative action requirements if the contractor has 50 or more employees and has a contract of $50,000 or more.)

OMB Control No: _____
Approved: _____
Approval Expires: _____

Environmental Protection Agency

Disadvantaged Business Enterprise Program
DBE Subcontractor Participation Form

NAME OF SUBCONTRACTOR[1]	PROJECT NAME
ADDRESS	CONTRACT NO.
TELEPHONE NO.	E-MAIL ADDRESS
PRIME CONTRACTOR NAME	

Please use the space below to report any concerns regarding the above EPA-funded project (e.g., reason for termination by prime contractor, late payment, etc.).

_____
_____
_____
_____
_____

CONTRACT ITEM NO.	ITEM OF WORK OR DESCRIPTION OF SERVICES RECEIVED FROM THE PRIME CONTRACTOR	AMOUNT SUBCONTRACTOR WAS PAID BY PRIME CONTRACTOR

_____ _____
Subcontractor Signature Title/Date

[1]Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

EPA FORM 6100-2 (DBE Subcontractor Participation Form)

APPENDIX E
NOTICE TO LABOR UNIONS OR OTHER ORGANIZATION OF WORKERS
NON-DISCRIMINATION IN EMPLOYMENT

TO: _____
(name of union or organization of worker)

The undersigned currently holds contract(s) with _____
(name of applicant)
_____ involving funds or credit of the U.S. Government or (a) subcontract(s) with a prime contractor holding such contract(s).

You are advised that under the provisions of the above contract(s) or subcontract(s) and in accordance with Section 202 of Executive Order 11246 dated September 24, 1965, the undersigned is obliged not to discriminate against any employee or applicant for employment because of race, color, creed, or national origin. This obligation not to discriminate in employment includes, but is not limited to, the following:

EMPLOYMENT, UPGRADING, TRANSFER OR DEMOTION

RECRUITMENT AND ADVERTISING
RATES OF PAY OR OTHER FORMS OF COMPENSATION

SELECTION FOR TRAINING INCLUDING APPRENTICESHIP, LAYOFF OR TERMINATION

This notice is furnished you pursuant to the provisions of the above contract(s) or subcontract(s) and Executive Order 11246.

Copies of this notice will be posted by the undersigned in conspicuous places available to employees or applicants for employment.

_____

_____

_____

_____
(contractor or subcontractor(s)

_____
(Date)

APPENDIX F

STANDARD FORM 100 (EEO-1)

- Each construction and non-construction contractor and subcontractor who has 1) 50 or more employees and 2) signs a contract, subcontract or purchase order amounting to $50,000 or more, shall file complete and accurate reports on Standard Form 100 (EEO-1) in triplicate to EPA within 30 days after the award to him of such a contract or purchase order, unless such person has submitted such a report within 12 months preceding the date of award. Subsequent reports shall be submitted annually on or before the 31st day of March.

- Failure to file timely, complete and accurate reports as required constitutes noncompliance with contractors' or subcontractors' obligations under Executive Order 11246, as amended, and is grounds for the imposition of sanctions authorized by Executive Order 11246 and other rules and regulations issued pursuant thereto.

Standard Form 100
(Rev. 12/78)
O.M.B. No. 3046-0007
100-210

EQUAL EMPLOYMENT OPPORTUNITY

EMPLOYER INFORMATION REPORT EEO-1

Joint Reporting Committee

- **Equal Employment Opportunity Commission**
- **Office of Federal Contract Compliance Programs**

Section A – TYPE OF REPORT

Refer to instructions for number and types of reports to be filed.

1. Indicate by marking in the appropriate box the type of reporting unit for which this copy of the form is submitted (MARK ONLY ONE BOX).

(1) ☐ Single-establishment Employer Report

Multi-establishment Employer:

(2) ☐ Consolidated Report

(3) ☐ Headquarters Unit Report

(4) ☐ Individual Establishment Report (submit one for each establishment with 25 or more employees)

(5) ☐ Special Report

2. Total number of reports being filed by this Company (Answer on Consolidated Report only) _____

Section B – COMPANY IDENTIFICATION (To be answered by all employers)

OFFICE USE ONLY

1. Parent Company

a. Name of parent company (owns or controls establishment in item 2) omit if same as label)

a.

Name of receiving office | Address (Number and street)

b.

City of town | County | State | ZIP code | b. Employer Identification No.

2. Establishment for which this report is filed. (Omit if same as label)

a. Name of establishment

c.

Address (Number and street) | City of town | County | State | ZIP code

d.

b. Employer Identification No. | (If same as label, skip.)

3. Parent company affiliation

(Multi-establishment Employers Answer on Consolidated Report only)

a. Name of parent-affiliated company | b. Employer Identification No.

Address (Number and street) | City or town | County | State | ZIP code

Section C – EMPLOYERS WHO ARE REQUIRED TO FILE (To be answered by all employers)

☐ Yes ☐ No — 1. Does the entire company have at least 100 employees in the payroll period for which you are reporting?

☐ Yes ☐ No — 2. Is your company affiliated through common ownership and/or centralized management with other entities in an enterprise with a total employment of 100 or more?

☐ Yes ☐ No — 3. Does the company or any of its establishments (a) have 50 or more employees AND (b) is not exempt as provided by 41 CFR 60-1.5, AND either (1) is a prime government contractor or first-tier subcontractor, and has a contract, subcontract, or purchase order amounting to $50,000 or more, or (2) serves as a depository of Government funds in any amount or is a financial institution which is an issuing and paying agent for U.S. Savings Bonds and Savings Notes?

NOTE: If the answer is yes to ANY of these questions, complete the entire form, otherwise skip to Section G.

SECTION D – EMPLOYMENT DATA

Employment at this establishment—Report all permanent, temporary, or part-time employees including apprentices and on-the-job trainees unless specifically excluded as set forth in the instructions. Enter the appropriate figures on all lines and in all columns. Blank spaces will be considered as zeros.

JOB CATEGORIES	NUMBER OF EMPLOYEES										
		MALE					FEMALE				
	OVERALL TOTALS (SUM OF COL B THRU K)	WHITE (NOT OF HISPANIC ORIGIN)	BLACK (NOT OF HISPANIC ORIGIN)	HISPANIC	ASIAN OR PACIFIC ISLANDER	AMERICAN INDIAN OR ALASKAN NATIVE	WHITE (NOT OF HISPANIC ORIGIN)	BLACK (NOT OF HISPANIC ORIGINA)	HISPANIC	ASIAN OR PACIFIC ISLANDER	AMERICAN INDIAN OR ALASKAN NATIVE
	A	B	C	D	E	F	G	H	I	J	K
Officials and Managers											
Professionals											
Technicians											
Sales Workers											
Office and Clerical											
Craft Workers (Skilled)											
Operatives (Semi-Skilled)											
Laborers (Unskilled)											
Service Workers											
TOTAL											
Total employment reported in previous EEO-1 report											
(The trainees below should also be included in the figures for the appropriate occupational categories above)											
Formal On-the job trainee: White collar											
Formal On-the job trainee: Production											

1. NOTE: On consolidated report, skip questions 2-5 and Section E
2. How was information as to race or ethnic group in Section D obtained?
   1 ☐ Visual Survey
   2 ☐ Employment Record
   3 ☐ Other—Specify ……
   ……..
3. Dates of payroll period used -
4. Pay period of last report submitted for this establishment
   _____
5. Does this establishment employ apprentices?
   This year? 1 ☐ Yes 2 ☐ No
   Last year? 1 ☐ Yes 2 ☐ No

Section E – ESTABLISHMENT INFORMATION

1. Is the location of the establishment the same as that reported last year?
   1 ☐ Yes 2 ☐ No 3. ☐ Did not report last year. 4. Reported on combined basis.
2. Is the major business activity at this establishment the same as that reported last year?
   1 ☐ Yes 2 ☐ No 3. ☐ No report last year 4. ☐ Reported on combined basis.
3. What is the major activity of this establishment? (Be specific, i.e., manufacturing steel castings, retail grocer, wholesale plumbing supplies, title insurance, etc. Include the specific type of product or type of service provided, as well as the principal business or industrial activity.

OFFICE USE ONLY

e.

Section F – REMARKS

Use this item to give any identification data appearing on last report which differs from that given above, explain major changes in composition or reporting units and other pertinent information.

Section G – CERTIFICATION (See Instructions G)

Check one

1 ☐ All reports are accurate and were prepared in accordance with the instructions (check on consolidated only)

2 ☐ This report is accurate and was prepared in accordance with the instructions

Name of Certifying Official	Title	Signature	Date

Name of person to contact regarding this report (Type or print)	Address (Number and street)	

Title	City and State	ZIP code	Telephone Area Code	Number	Extension

All reports and information obtained from individual reports will be kept confidential as required by Section 709 (e) of Title VII

APPENDIX G

(EXECUTIVE ORDER 11246)

REQUIREMENTS FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY

41 CFR 60.4.2(a)

1. The Offeror's or Bidder's attention is called to the "Equal Opportunity Clause" and the Standard Federal Equal Employment Opportunity Construction Contract Specifications.

2. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade can be obtained from the Department of Labor, Office of Federal Contract Compliance Programs.

These goals are applicable to all the contractor's construction work (whether or not it is Federal or federally assisted) performed in the covered area.

The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specification affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a). And its efforts to meet the goals established for the geographical area where the contract resulting from this solicitation is to be performed. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the Executive Order and the regulations in 41 CFR 60-4. Compliance with the goals will be measured against the total work hours performed.

3. The prime contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs, and Director of the Office of Small & Disadvantaged Businesses, EPA, within 10 working days of award of any construction subcontract in excess of $10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the following:

1. Name of contractor.
2. Address.
3. Telephone number.
4. Employer identification number.
5. Estimated dollar amount of subcontract.
6. Estimated starting and completion dates.
7. Geographical area in which the contract is to be performed; i.e., city, county, state, etc.
8. Copy of the tabulations of bids or offerors and the name of each offeror or bidder.

Send information to:

Director
Office of Federal Contract
Compliance Programs
Department of Labor
200 Constitutional Avenue
Washington, DC 20210

Director
Office of Small &
Disadvantaged Businesses
Crystal Mall 2
1921 Jefferson-Davis Hwy.
Room 118
Arlington, VA 20460

The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:

a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.

b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations where the Contractor or its unions have employment opportunities available, and maintain a record of the organizations responses.

c. Maintain a current file of the names, addresses, and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefore along with whatever additional actions the Contractor may have taken.

d. Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractors efforts to meet its obligations.

e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minority and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under b above.

f. Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

g. Review, at least annually, the company's EEO policy and affirmative actions obligations under these specifications with all employees having any responsibility for

hiring, assignment, layoff, termination or other employment decisions including specific review of these items with on-site supervisory personnel such as Superintendents, General Foremen, etc; prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meeting, persons attending, subject matter discussed, and disposition of the subject matter.

h. Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to the discussing the Contractor's EEO policy with other Contractors and Subcontractors with whom the Contractor does or anticipates doing business.

i. Direct its recruitment efforts, both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractors recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment sources, the Contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a Contractor's work force.

k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.

l. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.

m. Ensure that seniority practices, job classifications, work assignment and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.

n. Ensure that all facilities and company activities are non-segregated except that in separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between sexes.

o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

p. Conduct a review, at least annually, of all supervisors' adherence to and performance under the Contractor's EEO policies and affirmative action obligations.

APPENDIX H

EQUAL OPPORTUNITY CLAUSE

41CFR 60-1.4(b) Federally Assisted Construction Contracts (Prime Contractors & Subcontractors)

The applicant hereby agrees that it will incorporate or cause to be incorporated into any contract for construction work, or modification thereof, as defined in the regulations of the Secretary of Labor at 41 CFR Chapter 60, which is paid for in whole or in part with funds obtained from the Federal Government or borrowed on the credit of the Federal Government pursuant to a grant, contract, loan insurance, or guarantee, or undertaken pursuant to any Federal program involving such grant, contract, loan, insurance, or guarantee, the following equal opportunity clause:

During the performance of this contract, the contractor agrees as follows:

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

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

(3) The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(4) The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(5) The contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(6) In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other

sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(7) The contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) and (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance: Provided, however, That in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency the contractor may request the United States or enter into such litigation to protect the interests of the United States.

The applicant further agrees that it will be bound by the above equal opportunity clause with respect to its own employment practices when it participates in federally assisted construction work: Provided, That if the applicant so participating is a State or local government, the above equal opportunity clause and the rules, regulations, and relevant orders of the Secretary of Labor that it will furnish the administering agency and the Secretary of Labor such information as they may require for the supervision of such compliance, and that it will otherwise assist the administering agency in the discharge of the agency's primary responsibility for securing compliance.

The applicant further agrees that it will refrain from entering into any contract or contract modification subject to Executive Order 11246 of September 24, 1965, with a contractor debarred from, or who has not demonstrated eligibility for, Government contracts and federally assisted construction contracts pursuant to the Executive order and will carry out such sanctions and penalties for violation of the equal opportunity clause as may be imposed upon contractors and subcontractors by the administering agency or the Secretary of Labor pursuant to Part II, Subpart D of the Executive order. In addition, the applicant agrees that if it fails or refuses to comply with these undertakings, the administering agency may take any or all of the following actions: Cancel, terminate, or suspend in whole or in part this grant (contract, loan, insurance, guarantee); refrain from extending any further assistance to the applicant under the program with respect to which the failure or refund occurred until satisfactory assurance of future compliance has been received from such applicant: and refer the case to the Department of Justice for appropriate legal proceedings.

APPENDIX I

AFFIRMATIVE ACTION PROGRAM

(a) Each non-construction prime contractor and subcontractor who has 50 or more employees and has a government contract of $50,000 or more must develop a written affirmative action compliance program for each of its establishments. A necessary prerequisite to the development of a satisfactory affirmative action program is the identification and analysis of problem areas inherent in minority employment and an evaluation of opportunities for utilization of minority group personnel. The contractor's program shall provide in detail for specific steps to guarantee equal employment opportunity keyed to the problems and needs of members of minority groups, including, when there are deficiencies, the development of specific goals and time tables for the prompt achievement of full and equal employment opportunity. Each contractor shall include in its affirmative action compliance program a table of job classifications. This table should include but need not be limited to job titles, principal duties (and auxiliary duties, if any), rates of pay, and where more than one rate of any applied (because of length of time in the job or other factors), the applicable rates rates. The affirmative action compliance program shall be signed by an executive official of the contractor.

(b) Utilization evaluation. The evaluation of utilization of minority group personnel shall include the following:

(1) An analysis of minority group representation in all job categories.

(2) An analysis of hiring practices for the past year, including recruitment sources and testing, to determine whether equal employment opportunity is being afforded in all job categories.

(3) An analysis of upgrading, transfer and promotion for the past year to determine whether equal employment opportunity is being afforded.

(c) Maintenance of programs. Within 120 days from the commencement of the contract, each contractor shall maintain a copy of separate affirmative action compliance programs for each establishment, including evaluations of utilization of minority group personnel and the job classification tables, at each local office responsible for the personnel matters of such establishment. An affirmative action compliance program shall be part of the manpower and training plans for each new establishment and shall be developed and made available prior to the staffing of such establishment. A report of the results of such program shall be compiled annually and the program shall be updated at that time. This information shall be made available to representatives of the Director upon request and the contractor's affirmative action program and the result it produces shall be evaluated as part of compliance review activities.

which guides the Coast Guard in complying with the National Environmental Policy Act of 1969 (NEPA) (42 U.S.C. 4321–4370f), and have concluded that there are no factors in this case that would limit the use of a categorical exclusion under section 2.B.2 of the Instruction. Therefore, this rule is categorically excluded, under figure 2–1, paragraph (34)(g), of the Instruction, from further environmental documentation. Under figure 2–1, paragraph (34)(g), of the Instruction, an "Environmental Analysis Check List" and a "Categorical Exclusion Determination" are not required for this rule because it concerns an emergency situation of less than 1 week in duration.

List of Subjects in 33 CFR Part 165

Harbors, Marine safety, Navigation (water), Reporting and recordkeeping requirements, Security measures, and Waterways.

■ For the reasons discussed in the preamble, the Coast Guard amends 33 CFR part 165 as follows:

PART 165—REGULATED NAVIGATION AREAS AND LIMITED ACCESS AREAS

■ 1. The authority citation for part 165 continues to read as follows:

Authority: 33 U.S.C. 1226, 1231; 46 U.S.C. Chapter 701; 50 U.S.C. 191, 195; 33 CFR 1.05–1, 6.04–1, 6.04–6, and 160.5; Pub. L. 107–295, 116 Stat. 2064; Department of Homeland Security Delegation No. 0170.1.

■ 2. Add temporary § 165.T01–0173 to read as follows:

§ 165.T01–0173 Safety Zone: Longwood Events Wedding Fireworks Display, Boston Harbor, Boston, MA.

(a) *Location.* The following area is a safety zone:

All waters of Boston Harbor, from surface to bottom, within a four hundred (400) yard radius of the fireworks launch site located in Boston Harbor at approximate position 42°21′42″ N, 071°2′36″ W.

(b) *Effective Date.* This rule is effective from 8:45 p.m. through 9:45 p.m. on March 29, 2008.

(c) Definitions. (1) Designated representative means a Coast Guard Patrol Commander, including a Coast Guard coxswain, petty officer, or other officer operating a Coast Guard vessel or a Federal, State, or local officer designated by or assisting the Captain of the Port (COTP).

(2) [Reserved]

(d) *Regulations.* (1) In accordance with the general regulations in section 165.23 of this part, entry into or movement within this zone by any person or vessel is prohibited unless authorized by the Captain of the Port (COTP), Boston or the COTP's designated representative.

(2) The safety zone is closed to all vessel traffic, except as may be permitted by the COTP or the COTP's designated representative.

(3) Vessel operators desiring to enter or operate within the safety zone must contact the COTP or the COTP's designated representative to obtain permission by calling the Sector Boston Command Center at 617–223–5761. Vessel operators given permission to enter or operate in the safety zone must comply with all directions given to them by the COTP or the COTP's designated representative.

Dated: March 12, 2008.

Gail P. Kulisch,

Captain, U.S. Coast Guard, Captain of the Port, Sector Boston.

[FR Doc. E8–6149 Filed 3–25–08; 8:45 am]

BILLING CODE 4910–15–P

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 30, 31, 33, 35, and 40

[Docket ID NO. EPA–HQ–OA–2002–0001; FRL–8545–9]

RIN 2090–AA38

Participation by Disadvantaged Business Enterprises in Procurement Under Environmental Protection Agency (EPA) Financial Assistance Agreements

AGENCY: Environmental Protection Agency.

ACTION: Final rule.

SUMMARY: This action will harmonize EPA's statutory Disadvantaged Business Enterprise procurement objectives with the United States Supreme Court's decision in *Adarand Constructors, Inc.* v. *Pena*, 515 U.S. 200 (1995). In that case, the Supreme Court extended strict judicial scrutiny to federal programs that use racial or ethnic criteria as a basis for decision making. Remedying discrimination is recognized as a compelling government interest, and this rule is promulgated on the understanding that the statutory provisions authorizing its adoption were enacted for that remedial purpose. This rule sets forth a narrowly tailored EPA program to serve the compelling government interest of remedying past and current racial discrimination through agency-wide DBE procurement objectives. EPA intends to evaluate the propriety of the Disadvantaged Business Enterprise program in 7 years through subsequent rulemaking. This rule also revises EPA's Minority Business Enterprise (MBE) and Women's Business Enterprise (WBE) program and renames it EPA's Disadvantaged Business Enterprise (DBE) Program. EPA is removing existing MBE/WBE specific provisions in regulations for grants and agreements with institutions of higher education, hospitals, and other non-profit organizations; and uniform administrative requirements for grants and cooperative agreements to state and local governments, state and local assistance, and research and demonstration grants, and is consolidating and adding to these provisions in this new regulation. This rule affects only procurements under EPA financial assistance agreements. This rule does not apply to direct Federal procurement actions. If you are a recipient of an EPA financial assistance agreement or an entity receiving an identified loan under a financial assistance agreement capitalizing a revolving loan fund, this rule may affect you.

DATES: This final rule is effective May 27, 2008.

ADDRESSES: EPA has established a docket for this action under Docket ID No. EPA–HQ–OA–2002–0001. All documents in the docket are listed on the *www.regulations.gov* Web site. Although listed in the index, some information is not publicly available, e.g., CBI or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, is not placed on the Internet and will be publicly available only in hard copy form. Publicly available docket materials are available either electronically through *www.regulations.gov* or in hard copy at the HQ EPA Docket Center, EPA/DC, EPA West, Room 3334, 1301 Constitution Ave., NW., Washington, DC 20004. The Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is (202) 566–1744, and the telephone number for the Office of Environmental Information is (202) 566–1752.

FOR FURTHER INFORMATION CONTACT: Kimberly Patrick, Attorney Advisor, Office of the Administrator, Office of Small and Disadvantaged Business Utilization (OSDBU) by phone at (202) 566–2605, by e-mail at *patrick.kimberly@epa.gov*, or by fax at (202) 566–0548; or Cassandra Freeman, Deputy Director, Office of the Administrator, OSDBU by phone at

"Rights to Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts and Cooperative Agreements," and any implementing regulations issued by EPA.

6. Clean Air Act (42 U.S.C. 7401 *et seq.*) and the Federal Water Pollution Control Act (33 U.S.C. 1251 *et seq.*), as amended—Contracts and subgrants of amounts in excess of $100,000 shall contain a provision that requires the recipient to agree to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401 *et seq.*) and the Federal Water Pollution Control Act as amended (33 U.S.C. 1251 *et seq.*). Violations shall be reported to the Regional Office of the Environmental Protection Agency (EPA).

7. Byrd Anti-Lobbying Amendment (31 U.S.C. 1352)—Contractors who apply or bid for an award of more than $100,000 shall file the required certification. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by 31 U.S.C. 1352. Each tier shall also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the recipient.

[61 FR 6067, Feb. 15, 1996, as amended at 72 FR 2427, Jan. 19, 2007]

PART 31—UNIFORM ADMINISTRATIVE REQUIREMENTS FOR GRANTS AND COOPERATIVE AGREEMENTS TO STATE AND LOCAL GOVERNMENTS

Subpart A—General

Sec.

Subpart B—Pre-Award Requirements

Subpart C—Post-Award Requirements

FINANCIAL ADMINISTRATION

CHANGES, PROPERTY, AND SUBAWARDS

REPORTS, RECORDS, RETENTION, AND ENFORCEMENT

Subpart D—After-the-Grant Requirements

Subpart E—Entitlement [Reserved]

Subpart F—Disputes

AUTHORITY: 33 U.S.C. 1251 *et seq.*; 42 U.S.C. 7401 *et seq.*; 42 U.S.C. 6901 *et seq.*; 42 U.S.C. 300f *et seq.*; 7 U.S.C. 136 *et seq.*; 15 U.S.C. 2601 *et seq.*; 42 U.S.C. 9601 *et seq.*; 20 U.S.C. 4011 *et seq.*; 33 U.S.C. 1401 *et seq.*

SOURCE: 53 FR 8075, 8087, Mar. 11, 1988, unless otherwise noted.

Subpart A—General

§ 31.1 Purpose and scope of this part.

This part establishes uniform administrative rules for Federal grants and cooperative agreements and subawards

Prospective bidders acknowledge and are responsible for obtaining a complete copy of 40 CFR Part 31 from the internet (see link below).

http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr;sid=88e89f279d7c846f4231208c3827a3ee;rgn=div5;view=text;node=40%3A1.0.1.2.29;idno=40;cc=ecfr

United States
Environmental Protection Agency

EPA Project Control Number

United States Environmental Protection Agency
Washington, DC 20460

Certification Regarding
Debarment, Suspension, and Other Responsibility Matters

The prospective participant certifies to the best of its knowledge and belief that it and the principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

(b) Have not within a three year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction: violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for otherwise criminally or civilly charged by a government entity (Federal, State, or local) with commission of any of the offenses enumerated in paragraph (1) (b) of this certification; and

(d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State, or local) terminated or cause or default.

I understand that a false statement on this certification may be ground for rejection of this proposal or termination of the award. In addition, under 18 USC Sec. 1001, a false statement may result in a fine of up to $10,000 or imprisonment for up to 5 years, or both.

Typed Name & Title of Authorized Representative

Signature of Authorized Representative Date

☐ I am unable to certify to the above statements. My explanation is attached.

NON-COLLUSIVE AFFIDAVIT

For Advertised Bids

State of _____)
County of _____)

_____, being first duly sworn, deposes and says that:

(1) He is _____
(Owner, Partner, Officer, Representative or Agent)
of _____, the Bidder that has submitted the attached bid;

(2) He is fully informed respecting the preparation and contents of the attached bid and of all pertinent circumstances respecting such bid;

(3) Such bid is genuine and is not a collusive or sham bid;

(4) Neither the said Bidder nor any of its officers, partners, owners, agents, representatives, employees or parties in interest, including this affidavit, has in any way colluded, conspired, connived, or agreed, directly or indirectly with any other bidder, firm or person to submit a collusive or sham bid in connection with the contract for which the attached bid has been submitted or to refrain from bidding in connection with such contract, or has in any manner, directly or indirectly, sought by unlawful agreement or collusion or communication or conference with any other bidder, firm or person to fix the price or prices in the bid price or the bid price of any other bidder, or to secure through any collusion, conspiracy, connivance or unlawful agreement any advantage against the City of Unalaska or any person interested in the proposed contract; and

(5) The price or prices in the attached bid are fair and proper and are not tainted by any collusion, conspiracy, connivance or unlawful agreement on the part of the Bidder or any of its agents, representatives, owners, employees, or parties in interest, including this affiant.

_____
(Name)

_____
(Title)

Subscribed and sworn to before me
this _____ day of _____ , 20____

_____

_____

My Commission Expires _____

STATE OF ALASKA
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

EQUAL EMPLOYMENT OPPORTUNITY STATEMENT OF ACKNOWLEDGEMENT

This statement of acknowledgement is required by the Equal Employment Opportunity Regulations of the Secretary of Labor (41 CFR 60-1.7(b)(1)) and must be completed by each Bidder and proposed Subcontractor participating in this contract.

PLEASE CHECK THE APPROPRIATE BOXES

THE ☐ Bidder ☐ proposed Subcontractor **hereby CERTIFIES:**

PART A. Bidders and proposed subcontractors with 50 or more employees and a federal contract amounting to $50,000 or more are required to submit one federal Standard Report Form 100 during each year the two conditions (50 employees and a $50,000 federal contract) exist.

The company named below (Part C) is exempt from the requirements of submitting the Standard Report Form 100 this year.

☐ NO (go to PART B) ☐ YES (go to PART C)

PART B. The company named below (Part C) has submitted the Standard Report Form 100 this year, or intends to at this time.

☐ NO ☐ YES

NOTE: Bidders and proposed Subcontractors who file Standard Report Form 100 may also be required to file Form CC-257 Monthly Employment Utilization Report if the project has significant financial impact on a community, or the bidder/subcontractor has signed an agreement to do so. At a minimum, the bidder/subcontractor is required to maintain records which reflect the reporting requirements of CC-257. Standard Report Form 100 and instructions may be obtained by writing to:

EEO-1 Joint Reporting Committee
P.O. Box 19100
Washington, DC 20036-9100
Telephone (866) 286-6440
Email: el.techassistance@eeoc.gov

PART C.

_____ _____
Signature of Authorized Representative of Company Date

_____ (_____) _____
Name of Company Telephone No.

_____ _____
Address of Company Zip Code

_____ _____
Project Name Contract Number

Joint Reporting Committee
- Equal Employment Opportunity Commission
- Office of Federal Contract Compliance Programs (Labor)

EQUAL EMPLOYMENT OPPORTUNITY

EMPLOYER INFORMATION REPORT EEO—1

Standard Form 100
REV. 01/2005

O.M.B. No. 3046-0007
EXPIRES 01/2009
100-214

Section A—TYPE OF REPORT

Refer to instructions for number and types of reports to be filed.

1. Indicate by marking in the appropriate box the type of reporting unit for which this copy of the form is submitted (MARK ONLY ONE BOX).

(1) ☐ Single-establishment Employer Report

Multi-establishment Employer:
(2) ☐ Consolidated Report (Required)
(3) ☐ Headquarters Unit Report (Required)
(4) ☐ Individual Establishment Report (submit one for each establishment with 50 or more employees)
(5) ☐ Special Report

2. Total number of reports being filed by this Company (Answer on Consolidated Report only)_____

Section B—COMPANY IDENTIFICATION *(To be answered by all employers)*

1. Parent Company				OFFICE USE ONLY
a. Name of parent company (owns or controls establishment in item 2) omit if same as label				a.
Address (Number and street)				b.
City or town	State		ZIP code	c.
2. Establishment for which this report is filed. (Omit if same as label)				
a. Name of establishment				d.
Address (Number and street)	City or Town	County	State / ZIP code	e.
b. Employer identification No. (IRS 9-DIGIT TAX NUMBER)				f.

c. Was an EEO–1 report filed for this establishment last year? ☐ Yes ☐ No

Section C—EMPLOYERS WHO ARE REQUIRED TO FILE *(To be answered by all employers)*

☐ Yes ☐ No 1. Does the entire company have at least 100 employees in the payroll period for which you are reporting?

☐ Yes ☐ No 2. Is your company affiliated through common ownership and/or centralized management with other entities in an enterprise with a total employment of 100 or more?

☐ Yes ☐ No 3. Does the company or any of its establishments (a) have 50 or more employees AND (b) is not exempt as provided by 41 CFR 60–1.5, AND either (1) is a prime government contractor or first-tier subcontactor, and has a contract, subcontract, or purchase order amounting to $50,000 or more, or (2) serves as a depository of Government funds in any amount or is a financial institution which is an issuing and paying agent for U.S. Savings Bonds and Savings Notes?

If the response to question C–3 is yes, please enter your Dun and Bradstreet identification number (if you have one): ☐☐☐☐☐☐☐☐☐

NOTE: If the answer is yes to questions 1, 2, or 3, complete the entire form, otherwise skip to Section G.

Section D-EMPLOYMENT DATA

Employment at this establishment – Report all permanent full- and part-time employees including apprentices and on-the-job trainees unless specifically excluded as set forth in the instructions. Enter the appropriate figures on all lines and in all columns. Blank spaces will be considered as zeros.

Job Categories	Number of Employees (Report employees in only one category)														
	Race/Ethnicity														
	Hispanic or Latino		Not-Hispanic or Latino												Total Col A - N
			Male						Female						
	Male	Female	White	Black or African American	Native Hawaiian or Other Pacific Islander	Asian	American Indian or Alaska Native	Two or more races	White	Black or African American	Native Hawaiian or Other Pacific Islander	Asian	American Indian or Alaska Native	Two or more races	
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Executive/Senior Level Officials and Managers 1.1															
First/Mid-Level Officials and Managers 1.2															
Professionals 2															
Technicians 3															
Sales Workers 4															
Administrative Support Workers 5															
Craft Workers 6															
Operatives 7															
Laborers and Helpers 8															
Service Workers 9															
TOTAL 10															
PREVIOUS YEAR TOTAL 11															

1. Date(s) of payroll period used: _____ (Omit on the Consolidated Report.)

Section E - ESTABLISHMENT INFORMATION (Omit on the Consolidated Report.)

1. What is the major activity of this establishment? (Be specific, i.e., manufacturing steel castings, retail grocer, wholesale plumbing supplies, title insurance, etc. Include the specific type of product or type of service provided, as well as the principal business or industrial activity.)

Section F - REMARKS

Use this item to give any identification data appearing on the last EEO-1 report which differs from that given above, explain major changes in composition of reporting units and other pertinent information.

Section G - CERTIFICATION

Check one
1 ☐ All reports are accurate and were prepared in accordance with the instructions. (Check on Consolidated Report only.)
2 ☐ This report is accurate and was prepared in accordance with the instructions.

Name of Certifying Official	Title	Signature	Date
Name of person to contact regarding this report	Title	Address (Number and Street)	
City and State	Zip Code	Telephone No. (including Area Code and Extension)	Email Address

All reports and information obtained from individual reports will be kept confidential as required by Section 709(e) of Title VII.
WILLFULLY FALSE STATEMENTS ON THIS REPORT ARE PUNISHABLE BY LAW, U.S. CODE, TITLE 18, SECTION 1001

STATE OF ALASKA
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

DISADVANTAGE BUSINESS ENTERPRISES
(MINORITY AND WOMEN-OWNED BUSINESS ENTERPRISES)
COMPLIANCE STATEMENT

To be eligible for award of this contract, the bidder/proposer must execute and submit, as part of his or her bid proposal, this statement relating to Disadvantage Business Enterprises (Minority and Woman-Owned Business Enterprises). This statement shall be deemed a material factor in the City's evaluation of this bid proposal. Failure to complete and submit this statement, or the inclusion of a false statement, shall render the bid proposal non-responsive.

The _____ (Company Name) acknowledges that Minority/Woman-Owned Business Enterprises (MBE/WBE) goal of ***5.91%*** *participation (with a good faith effort of* ***3.89****% MBE and* ***2.02****% WBE, Effective July 1, 2013 thru June 30, 2016) has been established for this contract, and hereby assures that it will meet the goal or provide documentation to show that the mandatory good faith efforts have been made.*

The undersigned certifies that this bidder/proposer is aware of and will comply with MBE/WBE goals of this project and all applicable federal and state statutes and regulations concerning Disadvantage Business Enterprises (Minority and Woman-owned Business Enterprises).

We certify that should we be declared successful bidder/best proposer we shall submit such data as required for award of the contract within the time limits set forth in the contract specifications unless otherwise specified. In addition, we acknowledge that Minority/Woman-Owned Business Enterprises Contract and Procurement Reports will be submitted to the City for each half year of active construction.

We understand that if we are the successful bidder/best proposer and we fail to meet the MBE and/or WBE goals, or fail to demonstrate that we have made the required good faith effort the City can render the bid proposal non-responsive.

Company Name_____ RFP/Contract_____

Authorized Signature_____

Title_____

STATE OF ALASKA
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

DISADVANTAGE BUSINESS ENTERPRISES
(MINORITY AND WOMEN-OWNED BUSINESS ENTERPRISES)
REPORT OF PARTICIPATION

Project Name_____ **RFP/Contract No.** _____

Company Name_____ **Prepared By**_____

The successful bidder/proposer must complete and submit this form after bid time, but prior to contract award. Please list below the name and address of each DBE (MBE/ WBE) subcontractor who will perform work under this contract, along with the contracted amount that will be applicable to the goal. Indicate whether the firm is MBE or WBE, and include your own firm if MBE/WBE eligible. A proposal submitted without adequate MBE/WBE participation or showing of good faith efforts to achieve such participation can render the bid proposal non-responsive. One copy of each executed MBE/WBE subcontract must be provided to the City by the successful prime contractor. Any changes to the list below must have prior approval by the City. Please note, if the MBE/WBE is only certified as a DBE, such as through the Alaska Department of Transportation, and the bidder has exhausted all efforts to determine the subcontractor MBE/WBE status, the bidder may document either category of certification to meet goal objectives.

Firm Name	AK Contractor's License No.	Contact Name & Phone No.	Type of Work	Contract Amount	MBE/WBE
				$	
				$	
				$	
				$	
				$	
				$	
				$	
				$	
				$	
				$	
				$	
				$	

Contract(s) Total: $\_\_\_\_\_ **MBE/WBE Goal:** \_\_% **Achieved:** \_\_% = **$**_____

Authorized Representative's Signature_____ **Date**_____

STATE OF ALASKA
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

DISADVANTAGE BUSINESS ENTERPRISES
(MINORITY AND WOMEN-OWNED BUSINESS ENTERPRISES)
CONTACT DOCUMENTATION

Project Name________________________________ **RFP/Contract No.** ________________

Company Name ____________________ **Authorized Signature/Title**________________________

This form is provided for your convenience to document your efforts in meeting DBE (MBE/WBE) utilization goals. You may use additional sheets if needed. If you do not meet the MBE/WBE goal, you may return this form, or other supporting documentation (explanations, advertising notices, solicitations, etc.) with your MBE/WBE Report of Participation.

Firm____________________________________ MBE______ WBE______
Address____

Type of Work____ Bid Amount $__________
Dates of Contact__________ ________ ________ ____________ ____________
Method of Contact__________ ________ ________ ____________ ____________
Contact's Name__________ ________ ________ ____________ ____________
Results of Contact__________ ________ ________ ____________ ____________
If rejected, why____

Firm____________________________________ MBE______ WBE______
Address____

Type of Work____ Bid Amount $__________
Dates of Contact__________ ________ ________ ____________ ____________
Method of Contact__________ ________ ________ ____________ ____________
Contact's Name__________ ________ ________ ____________ ____________
Results of Contact__________ ________ ________ ____________ ____________
If rejected, why____

Firm____________________________________ MBE______ WBE______
Address____

Type of Work____ Bid Amount $__________
Dates of Contact__________ ________ ________ ____________ ____________
Method of Contact__________ ________ ________ ____________ ____________
Contact's Name__________ ________ ________ ____________ ____________
Results of Contact__________ ________ ________ ____________ ____________
If rejected, why____

United States Environmental Protection Agency

OMB Control No: 2090-0030
Approved: 8/13/2013
Approval Expires: 8/31/2015

Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Participation Form

An EPA Financial Assistance Agreement Recipient must require its prime contractors to provide this form to its DBE subcontractors. This form gives a DBE[1] subcontractor[2] the opportunity to describe work received and/or report any concerns regarding the EPA-funded project (e.g., in areas such as termination by prime contractor, late payments, etc.). The DBE subcontractor can, as an option, complete and submit this form to the EPA DBE Coordinator at any time during the project period of performance.

Subcontractor Name	Project Name	
Bid/ Proposal No.	Assistance Agreement ID No. (if known)	Point of Contact
Address		
Telephone No.	Email Address	
Prime Contractor Name	Issuing/Funding Entity:	

Contract Item Number	Description of Work Received from the Prime Contractor Involving Construction, Services , Equipment or Supplies	Amount Received by Prime Contractor

[1] A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205 or certified by EPA. EPA accepts certifications from entities that meet or exceed EPA certification standards as described in 40 CFR 33.202.

[2] Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

United States Environmental Protection Agency

OMB Control No: 2090-0030
Approved: 8/13/2013
Approval Expires: 8/31/2015

Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Participation Form

Please use the space below to report any concerns regarding the above EPA-funded project:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Subcontractor Signature	Print Name
Title	**Date**

United States Environmental Protection Agency

OMB Control No: 2090-0030
Approved: 8/13/2013
Approval Expires: 8/31/2015

Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Performance Form

This form is intended to capture the DBE[1] subcontractor's[2] description of work to be performed and the price of the work submitted to the prime contractor. An EPA Financial Assistance Agreement Recipient must require its prime contractor to have its DBE subcontractors complete this form and include all completed forms in the prime contractors bid or proposal package.

Subcontractor Name	Project Name	
Bid/ Proposal No.	Assistance Agreement ID No. (if known)	Point of Contact
Address		
Telephone No.	Email Address	
Prime Contractor Name	Issuing/Funding Entity:	

Contract Item Number	Description of Work Submitted to the Prime Contractor Involving Construction, Services , Equipment or Supplies	Price of Work Submitted to the Prime Contractor

DBE Certified By: ___ DOT ___ SBA ___ Other: _____	Meets/ exceeds EPA certification standards? ___ YES ___ NO ___ Unknown

[1] A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205 or certified by EPA. EPA accepts certifications from entities that meet or exceed EPA certification standards as described in 40 CFR 33.202.

[2] Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

United States Environmental Protection Agency

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Approved: 8/13/2013
Approval Expires: 8/31/2015

Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Performance Form

I certify under penalty of perjury that the forgoing statements are true and correct. Signing this form does not signify a commitment to utilize the subcontractors above. I am aware of that in the event of a replacement of a subcontractor, I will adhere to the replacement requirements set forth in 40 CFR Part 33 Section 33.302 (c).

Prime Contractor Signature	Print Name
Title	**Date**

Subcontractor Signature	Print Name
Title	**Date**

United States Environmental Protection Agency

OMB Control No: 2090-0030
Approved: 8/13/2013
Approval Expires: 8/31/2015

Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Utilization Form

This form is intended to capture the prime contractor's actual and/or anticipated use of identified certified DBE[1] subcontractors[2] and the estimated dollar amount of each subcontract. An EPA Financial Assistance Agreement Recipient must require its prime contractors to complete this form and include it in the bid or proposal package. Prime contractors should also maintain a copy of this form on file.

Prime Contractor Name		Project Name
Bid/ Proposal No.	Assistance Agreement ID No. (if known)	Point of Contact
Address		
Telephone No.		Email Address
Issuing/Funding Entity:		

I have identified potential DBE certified subcontractors	___ YES	___ NO
If yes, please complete the table below. If no, please explain:		

Subcontractor Name/ Company Name	**Company Address/ Phone/ Email**	**Est. Dollar Amt**	**Currently DBE Certified?**

Continue on back if needed

[1] A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205 or certified by EPA. EPA accepts certifications from entities that meet or exceed EPA certification standards as described in 40 CFR 33.202.

[2] Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

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Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Utilization Form

I certify under penalty of perjury that the forgoing statements are true and correct. Signing this form does not signify a commitment to utilize the subcontractors above. I am aware of that in the event of a replacement of a subcontractor, I will adhere to the replacement requirements set forth in 40 CFR Part 33 Section 33.302 (c).

Prime Contractor Signature	Print Name
Title	**Date**

STATE OF ALASKA
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
ALASKA CLEAN WATER FUND & ALASKA DRINKING WATER FUND

DISADVANTAGE BUSINESS ENTERPRISES OVERVIEW

The loan recipient, consultant and contractor of an Alaska Clean Water or Drinking Water Fund revolving loan project are required to comply with EPA regulations (40 CFR Part 33) concerning the use of disadvantage owned businesses enterprises (DBE). Also required is compliance with EEO/Affirmative Action Regulations of the Department of Labor (see attached Statement of Acknowledgement). These regulations help ensure that economic opportunities are available to all people of this country.

The expenditure of Federal funds must reflect equal opportunity, anti-discrimination provisions of the 1964 Civil Rights Act, affirmative action and DBE or more specifically small, minority and women-owned businesses utilization under EPA's DBE program. Utilization may be through prime contracting, subcontracting, joint-venture, procurement of supplies, material or equipment, or other business participation utilized in completing a project. For all situations, contractors must take necessary and reasonable steps to ensure DBE's have the maximum opportunity to compete for and/or perform contracts. Contractors shall not discriminate on the basis of race, color, national origin, or sex in the award and performance of projects where assistance is provided from an ADEC revolving loan fund program.

NOTE: On March 26, 2008, the Environmental Protection Agency (EPA) Office of Small Business Programs (OSBP) published its final rule, "Participation by Disadvantaged Business Enterprises in Procurement under Environmental Protection Agency Financial Assistance Agreements (DBE Rule) in the Federal Register (40 CFR part 30-40). The final rule took effect on May 25, 2008. The EPA DBE Program encompasses many of the components of the former MBE/WBE Program and also includes changes.

Some changes are:

- Creation of the Disadvantaged Business Enterprise (DBE) Program (formerly the Minority Business Enterprise/Women's Business Enterprise (MBE/WBE) Program).

- Recipients receiving a total of $250K or less in financial assistance in a given fiscal year are exempt from this requirement.

- The "Six Affirmative Steps" and "Six Positive Efforts" were combined into the "Six Good Faith Efforts."

- A recipient must require its prime contractor to pay its subcontractor for satisfactory performance no more than 30 days from the prime contractor's receipt of payment from the recipient.

- The loan recipient must be notified in writing by its prime contractor prior to any termination of a DBE subcontractor.

- If a DBE subcontractor fails to complete work under the subcontract for any reason, the prime contractor must use the Six Good Faith Efforts in selecting a replacement subcontractor.

- The prime contractor must employ the Six Good Faith Efforts even if the prime has achieved its Fair Share Objectives.

- Recipients who reported quarterly under the old MBE/WBE program will now report semi-annually.

- MBE's and WBE's can no longer self-certify. They must be certified by EPA, Small Business Administration (SBA), Department of Transportation (DOT) or by state, local, Tribal or private entities whose certification criteria match EPA's. (MBEs and WBEs must be certified in order to be counted toward a recipient's MBE/WBE accomplishments.) The new requirements affect all financial assistance agreements entered into from the effective date of the rule (May 25, 2008). The new DBE rule won't affect those financial assistance agreements entered into before May 25, 2008; those will still operate under the old MBE/WBE program requirements.

SUMMARY OF GOALS

Stated simply, in meeting DBE goals under this program, the prime contractor must either 1) achieve the goal of contracting to Minority or Women-Owned Enterprises (MBE/WBE), or 2) follow the proper procedures in thoroughly documenting good faith efforts to achieve MBE/WBE goal participation. A prime contractor who is an MBE/WBE firm can also be counted towards the goal. (see attached current participation goals for the Department)

REQUIREMENTS

A. Definitions

- Disadvantaged Business Enterprise – Per EPA requirements for projects funded under the Alaska Drinking Water Fund and Alaska Clean Water Fund loan programs, Disadvantage Business Enterprises only include entities owned and/or controlled by socially and economically disadvantaged individuals (as described in 4242 USC 7601 and 42 USC 4370d) – which includes Women's Business Enterprises (WBE) and Minority Business Enterprises (MBE). (for more information go to: http://www.epa.gov/osbp/grants.htm)

- Minority Business Enterprise or Women Owned Business Enterprise – means a small business concern which is owned and controlled by one or more minorities or women. Owned and controlled means a business:

    1. Which is at least 51 percent owned by one or more minorities or women, or in the case of a publicly owned business, at least 51% of the stock is owned by one or more minorities or women;

2. Whose management and daily business operations are controlled by one or more such individuals.

- Socially Disadvantage Individual – means a person who is a citizen or lawful permanent resident of the United States and who is:
    - Black;
    - Hispanic;
    - Portuguese;
    - Asian American;
    - American Indian and Alaskan Native; and
    - Members of other groups, or other individuals, found to be economically and socially disadvantaged by the United States Small Business Administration under section 8(a) of the federal Small Business Act.
- Economically Disadvantaged Individual – those socially disadvantaged individuals whose ability to compete in the free enterprise system has been impaired due to diminished capital or credit opportunities, as compared to others in the same business area who are not socially disadvantaged.

B. Implementation for DBE Procurement

As part of ADEC's capitalization grants for both the ADWF and ACWF loan programs, the programs have an overall Fair Share (or utilization goal) objective of 3.89% for MBE entities and 2.02% for WBE entities for construction only (effective July 1, 2013 – June 30, 2016). The loan recipient, engineering firm responsible for construction phase services, and prime contractor are required to adopt this same fair objective. The fair share objective is not a quota, EPA cannot penalize ADEC, the loan recipient, engineering firm, of the prime contractor for not meeting MBE or WBE participation objectives.

The prime contractor and consulting engineer responsible for construction phase services are required to make the good faith efforts and apply necessary administrative requirements. If the good faith efforts are not made when subcontracts are considered for the prime construction contract or for engineering construction phase services, the ability of ADEC to fund the project, or portion thereof, may be jeopardized.

C. How to Count DBE (MBE/WBE) Goals

The proposed MBE/WBE firms to be used must be declared by the Bidder before contract award. The MBE/WBE may act as a prime contractor, subcontractor, joint venture partner, or supplier. To be counted toward a goal, the MBE/WBE must perform a commercially useful function. To calculate the minimum dollar value for MBE/WBE participation, multiply the total estimated contract price (including additives or alternates, if any) by the goal percentage.

D. How to Obtain DBE (MBE/WBE) Participation

Prior to the scheduled pre-bid conference, solicit MBE/WBE participation to meet the goal. By contract award, the Bidder must either meet the goal or have made good faith efforts to do so. Good faith efforts include, but are not limited to the following:

1. Including qualified small, minority and women's business enterprises on solicitation lists.

2. Assuring that small, minority and women's businesses are solicited. If the MBE/WBE is only certified as a DBE, such as through the Alaska Department of Transportation, and the bidder has exhausted all efforts to determine the subcontractor MBE/WBE status, the bidder may document either category of certification to meet goal objectives.

3. Dividing total requirements when economically feasible, into small tasks or quantities to permit maximum participation of small, minority and women's businesses.

4. Establish delivery schedules, where requirements of the work permit, which will encourage participation by small, minority and women's businesses.

5. Using the services and assistance of the Small Business Administration and the Minority Business Development Agency of the U.S. Department of Commerce, as appropriate.

6. If the prime contractor or proposer awards subcontracts/procurements, require the subcontractor to take the affirmative steps 1 through 5 above.

E. How to Credit DBE (MBE/WBE) Participation

If the Bidder's firm is a qualified Minority or Women-Owned Business Enterprise, credit will be given for the portion of the contract for which the Bidder performs a commercially useful function, and for that portion that is subcontracted to other MBE/WBE firms. For example, a MBE/WBE prime contractor proposes to perform 60% of a project quoted at $500,000, and subcontracts 20% to a majority firm and the remaining 20% to another MBE/WBE. This means the credited MBE/WBE participation will be 80% for the project (60% + 20%) or $400,000.

F. The DBE (MBE/WBE) Reporting Package

To meet the MBE/WBE reporting requirements of the program, the following forms need to be submitted during the course of bidding, contract award, and administration of this project:

1. COMPLIANCE STATEMENT - acknowledges the MBE/WBE requirement by the bidder. It must be provided with the bid.

2. REPORT OF PARTICIPATION – documents the level of anticipated MBE/WBE participation. It is submitted after bid opening, but before contract award.

3. CONTACT DOCUMENTATION – documents the efforts taken to attain the MBE/WBE goals and it, or other documentation should be submitted with the Report of Participation if the bidder did not meet the established goal.

4. GOOD FAITH EFFORTS – Forms 6100-2, -3 and -4 that identify subcontractor participation, performance and utilization, respectively.

Form 6100-2: This form gives a DBE subcontractor the opportunity to describe the work the DBE subcontractor received from the prime contractor, how much the DBE subcontractor was paid, and any other concerns the DBE subcontractor might have.

This form must be provided to the DBE subcontractor. If the form is submitted by the DBE subcontractor it must be maintained in the file with the prime's contract.

Form 6100-3: This form captures an intended subcontractor's description of work to be performed for the prime contractor and the price of the work submitted to the prime.

This form must be completed by every DBE subcontractor and submitted as part of the bid or proposal package. It must be maintained in the file with the prime's contract.

Form 6100-4: This form captures the prime's intended use of an identified DBE subcontractor, and the dollar amount of the subcontract.

This form must be completed by the prime contractor and submitted as part of the bid or proposal package. It must be maintained in the file with the prime's contract.

5. CONTRACT & PROCUREMENT SEMI-ANNUAL REPORT – documents the actual MBE/WBE contracts executed by the Prime Contractor and submitted to the City. In the first week of April (reporting period, Oct – Mar) and October (reporting period, Apr – Sep), the City will submit a listing of the executed contracts (for the previous reporting) to the Alaska Department of Environmental Conservation through use of form 5700-52A. (form available at: http://www.epa.gov/osbp/pdfs/5700_52a.pdf)

G. Create and Maintain a Bidders List

Any entity that receives an ACWF or ADWF SRF loan is required to create and maintain a bidders list if the loan recipient is subject to, or chooses to follow, competitive bidding requirements. **The list must include all firms that bid or quote on prime contracts, or bid or quote subcontracts, including both MBE/WBEs and non-MBE/WBEs** and must be maintained until the end of the project.

H. DBE Anti-Discrimination Contract Clause

Under 40 CFR part 33, Appendix A, the following statement must be included in **every contract** issued by an ACWF/ADWF borrower to a prime contractor. The statement cannot be changed, modified, or altered in any way.

"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."