
Chelan Tailrace Pump Station Pump Procurement

Technical Specifications 90% Review

Volume 1

Prepared for

**Public Utility District No. 1
of Chelan County**

April 2007

CH2MHILL



SECTION A

ADVERTISEMENT FOR <<CONTRACTTYPEFULL>> NO. <<BIDINVITATION_ID>>

Sealed bids will be received by Public Utility District No. 1 of Chelan County, Washington, at the office of the District, Attention: <<ContractAdministrator>>, Procurement and Contract Services, 327 North Wenatchee Avenue, Wenatchee, Washington, 98801, until <<OpeningTime>>, Pacific Time, <<OpeningDate>>, for supplying all facilities, labor, materials, and equipment as specified, and performing all work required for the

<<BidName>>.

in accordance with the Contract Documents.

The Contract Documents, in whole or in part, are available in read-only format at http://www.chelanpud.org/PCS_Bids. The District makes no representation as to the completeness of the electronic file. Prospective Bidders may obtain Contract Documents from the Procurement and Contract Services Department. Requests are accepted online at http://www.chelanpud.org/PCS_Bids, or in writing to P.O. Box 1231, or in person at 327 North Wenatchee Avenue, Wenatchee, 98801, or by telephone at (509) 661-4338 or (888) 663-8121, extension 4338.

Bidders desiring to bid on <<ContractTypeAbbr>> No. <<Bidinvitation_ID>>, <<BidName>>, must be prequalified to perform the Work as required by the Revised Code of Washington (RCW 54.04.085) in order to obtain copies of the Bidding Documents, including the bid form, for such work.

<<PreBidMtg>> If you have questions on location of the site inspection, please contact the Project Manager below:

Public Utility District No. 1 of Chelan County
P.O. Box 1231, 327 North Wenatchee Avenue
Wenatchee, Washington 98807

Telephone: (509) 661-<<ORIGINATOR_PHONE>> or (888) 663-8121, extension
<<ORIGINATOR_PHONE>>
Attention: <<ProjectMgr>>

The District reserves the right to reject any and/or all bids, and/or to waive informalities, and to accept any bid which is in the District's best interests.

END OF SECTION A



SECTION B

BIDDING INSTRUCTIONS

TABLE OF CONTENTS

1. RECEIPT AND OPENING OF BIDS	2
2. PREPARATION OF BIDS	2
3. CLARIFICATION OF BID	3
4. EXTENSION OF DUE DATE	3
5. DELAY IN RECEIPT OF PROPOSAL	3
6. WITHDRAWAL OF BIDS	3
7. BID PRICE	4
8. BID BOND OR DEPOSIT	4
9. PERFORMANCE AND PAYMENT BOND	5
10. TIME OF COMPLETION AND LIQUIDATED DAMAGES	5
11. EXAMINATION OF CONTRACT DOCUMENTS	5
12. INTENT OF CONTRACT DOCUMENTS	6
13. CLARIFICATION OF CONTRACT DOCUMENTS	6
14. CHANGES TO CONTRACT DOCUMENTS	6
15. LAWS AND REGULATIONS	7
16. ENVIRONMENTAL LEGISLATION	7
17. CONDITIONS OF WORK	7
18. EXAMINATION OF SITE	8
19. EXCEPTIONS TO CONTRACT DOCUMENTS	8
20. QUALIFICATIONS OF BIDDER	8
21. SUBCONTRACTS	9
22. EVALUATION OF BIDS	9
23. CONTRACT AWARD	10
24. BID GUARANTY	10
25. MATERIAL IDENTIFICATION	11

SECTION B
BIDDING INSTRUCTIONS

1. RECEIPT AND OPENING OF BIDS

Public Utility District No. 1 of Chelan County, Washington (herein called the "District"), invites bids on the forms contained in SECTION E, CONTRACT DOCUMENT FORMS of the Contract Documents. All blanks must be appropriately filled in. Bids will be received by the District at the office at 327 North Wenatchee Avenue, <<OpeningTime>>, Pacific Time, <<OpeningDate>>, and then at said office publicly opened and read aloud. The envelopes containing the bids must be sealed, addressed to <<ContractAdministrator>>, Procurement and Contract Services, Public Utility District No. 1 of Chelan County, at 327 North Wenatchee Avenue, P.O. Box 1231, Wenatchee, WA 98801, and designated as <<ContractTypeAbbr>> No. <<BidInvitation_ID>> for <<BidName>>. E-mail bids are not allowed. The District may waive any informalities or immaterial irregularities, as authorized by applicable law, or reject any and all bids. Any bid may be withdrawn prior to the above scheduled time for the opening of bids or authorized postponement thereof. Any bid received after the time and date specified shall not be considered except as otherwise permitted by these Contract Documents. No Bidder may withdraw a bid within 40 days after the actual date of the opening thereof.

2. PREPARATION OF BIDS

Each bid must be submitted on the prescribed forms contained in SECTION E, CONTRACT DOCUMENT FORMS, of the Contract Documents. All blank spaces for bid prices must be filled in, in ink or typewritten, and shall include the following:

- Original of the executed Bid Proposal form, • Bid Price Schedule, • Unit Price Schedule for Changed Work (if applicable), • Noncollusion Affidavit of Prime Bidder, • List of Proposed Subcontractors, and • Bidder's Data (if applicable).
- Acknowledgment of receipt of Addenda to Contract Documents on Bid Proposal form.
- Bid Bond, or certified or cashier's check.

Bidder's failure to properly complete or submit the above referenced documents may result in rejection of its bid if the omission is determined by the District to be material.

Insert A for page B-2-- Bidding Instruction; Page B-3; 2. Preparation of Bids

- Original of the executed Bid Proposal form
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 - Noncollusion Affidavit of Prime Bidder
 - List of Proposed Subcontractors
 - Bidder's Data

This document should list ten (10) projects of similar scope that confirms the Bidder's qualifications. Information for each project shall include:

 - Scope of Contractor's responsibility
 - Description of items designed, manufactured and installed including dates.
 - Customer contact name, phone number, and email address
 - Dollar value of work.
 - Time to complete shop work and field work (days).
 - Two general arrangement drawings showing the pump system and cleaning equipment layout front and side elevations or two photographs.

3. CLARIFICATION OF BID

Any Bidder may submit data to clarify its bid in a sealed envelope at any time prior to the scheduled closing time for receipt of bids. If clarification is submitted by Electronic Transmission, it shall be sent to an independent third party and that third party shall deliver said clarification to the District in a sealed envelope at any time prior to the scheduled closing time for receipt of bids. All such communications must be received by the District prior to the time set for bid opening. If clarification is submitted by Electronic Transmission to an independent third party, Bidder shall mail or send via private carrier or courier to the District, prior to time set for bid opening, written confirmation of the Electronic Transmission clarification or modification with the signature of the Bidder. The sole purpose of this provision is to allow Bidders to clarify any perceived ambiguity in the terms or conditions of their bid or supporting data or to add or delete any terms or conditions to their bid. If written confirmation is not received within five (5) days from the time set for bid opening, no consideration will be given to the modification.

4. EXTENSION OF DUE DATE

The District reserves the right to extend the time for receiving and opening bids. If the time is extended, notice of the extension(s) will be given prior to the originally specified due date to each entity which has been furnished copies of the Contract Documents by the District.

5. DELAY IN RECEIPT OF PROPOSAL

Any bid received after the time and date specified may be marked as to date and time received and returned to Bidder unopened by the District. If a bid arrives by mail after the opening time and is postmarked at the post office of the Bidder sufficiently in advance of bid opening time to have normally reached the District prior to bid opening, and it is determined by the District that nonarrival on time was due solely to delay in the mails for which the Bidder was not responsible, such bid may be considered. A similar policy will be followed with regard to bids submitted via private carrier or courier.

6. WITHDRAWAL OF BIDS

A Bidder may withdraw its bid before the time set for opening sealed bids, but may not do so once that time arrives. However, if the District extends the time for receiving and opening sealed bids (SECTION B, BIDDING INSTRUCTIONS, EXTENSION OF DUE DATE), a Bidder may withdraw its bid until the new time for opening bids arrives. In addition, a Bidder, regardless of whether the District selects it as the lowest responsible bidder, may not withdraw its bid during the time the Bid Proposal states the bid shall remain in force.

7. BID PRICE

The Bid Price shall be submitted on the forms contained in SECTION E, CONTRACT DOCUMENT FORMS, of these Contract Documents.

Bidder shall fill in all prices for the Work and for each Alternate in the appropriate spaces provided in the Bid Proposal form and Bid Price Schedule(s).

The Work covered by the Contract Documents may fall under the statutes of the State of Washington relating to public works and payment of prevailing rate of wage as more fully set forth in the General Conditions contained herein.

The cost of furnishing a 100% Performance and Payment Bond shall be quoted on the Bid Proposal form based on the Bid Price, inclusive of coverage for Washington State sales tax.

The Bid Price shall be all inclusive to include the furnishing of all labor, supervision, materials, tools, equipment, permits, all taxes (excluding Washington State sales tax on the Bid Price), licenses, insurance, overhead, profit, temporary construction, temporary facilities, cleanup and all miscellaneous items for the Work as required by the Contract Documents. The District will pay the Contractor for Washington State sales tax; this tax shall be shown as a separate item on invoices and will be paid on the basis of Work completed with no portion withheld for retainage.

8. BID BOND OR DEPOSIT

Each bid must be accompanied by a certified or cashier's check, payable to the order of Public Utility District No. 1 of Chelan County, Washington, for a sum of not less than 5% of the amount of the Bid Price or by a Bid Bond, in the form included in SECTION E, CONTRACT DOCUMENT FORMS, BID BOND OR DEPOSIT, of these Contract Documents, in an amount not less than 5% of the amount of the Bid Price, with a corporate surety licensed to do business in the State of Washington, and acceptable to the District. The Bid Bond amount shall be calculated on the base Bid Price without consideration of options, if any. The Bid Bond shall be accompanied by a certified copy of the power of attorney authorizing the attorney-in-fact of the corporate Surety to execute and deliver the Bond on behalf of the Surety, together with a currently executed certificate of an authorized officer of the Surety stating that the power of attorney is in full force and effect. The certified or cashier's check or Bid Bond of all Bidders will be returned without interest within five (5) days after the Contract has been awarded for execution to the successful Bidder, except that of the successful Bidder which shall be retained until the Contract is entered into and a bond to perform the Work, with Surety Satisfactory to the District, is furnished in accordance with the Contract Documents. The Bid Bond shall be at the expense of the Bidder. The amount of the certified or cashier's check, if furnished, or Bid Bond will be forfeited to the District as liquidated

damages unless the successful Bidder enters into a Contract in accordance with its bid within ten (10) days after it is notified that it is the successful Bidder. Bidders may file an annual Bid Bond in a form acceptable to the District to satisfy the Bid Bond requirement for any bid submitted by the Bidder during the applicable period of coverage.

9. PERFORMANCE AND PAYMENT BOND

The successful Bidder must, within ten (10) days after it is notified that it is the successful Bidder by the delivery of a Notice of Award, furnish a Performance and Payment Bond which must be submitted on the form included in SECTION E, CONTRACT DOCUMENT FORMS, of these Contract Documents. The Performance and Payment Bond shall be for 100% of the Contract Price unless otherwise specified in Supplemental Conditions, inclusive of coverage for Washington State sales tax. The Performance and Payment Bond shall extend through the warranty period, which Performance and Payment Bond shall be executed with a Satisfactory Surety and authorized to issue surety bonds in the State of Washington. The Performance and Payment Bond shall be accompanied by a certified copy of the power of attorney authorizing the attorney-in-fact of the corporate Surety to execute and deliver the Bond on behalf of the Surety, together with a currently executed certificate of an authorized officer of the Surety stating that the power of attorney is in full force and effect. The actual cost of the Performance and Payment Bond shall be borne by the successful Bidder. At the District's sole discretion, authorization may be given to Contractor to begin the Work while finalizing minor deficiencies in the Performance and Payment Bond; progress payment(s) may be withheld until the deficiency(ies) is corrected.

10. TIME OF COMPLETION AND LIQUIDATED DAMAGES

The Bidder shall base its bid upon the completion schedule included in the Contract Documents. Bidder (Contractor) agrees to commence Work on or before a date to be specified in a written Notice to Proceed issued by the District and to strictly comply with the completion schedule specified in the Contract Documents.

IMPORTANT: This Contract may contain a liquidated damages provision in SECTION D, SUPPLEMENTAL CONDITIONS, based on the completion schedule.

11. EXAMINATION OF CONTRACT DOCUMENTS

Each Bidder shall thoroughly examine and be familiar with the Contract Drawings, Specifications and other Contract Documents, and submission of a bid shall constitute an acknowledgment upon which the District may rely that the Bidder has thoroughly examined all Contract Documents. No claim for additional compensation will be allowed which is based upon a lack of knowledge of the Contract Documents.

12. INTENT OF CONTRACT DOCUMENTS

All provisions of the Contract Documents are intended to be mutually cooperative and anything required in one and omitted from another shall be as binding as if called for in all, and in the event of a conflict in provisions, the Work shall be done in the manner most satisfactory to the District. It is the intent of the Contract Documents to include every requisite and necessity to properly furnish the entire Work, notwithstanding the fact that every item necessarily involved may not be particularly mentioned. All Work, when finished, shall be complete and in undamaged condition.

13. CLARIFICATION OF CONTRACT DOCUMENTS

If a Bidder requires clarification of the Contract Documents, the Bidder shall at once forward to the District a written request for interpretation, clarification, or qualification before submitting its bid. The Bidder making this request is solely responsible for its timely receipt. The District will reply only in the form of written Addenda. The District shall neither be bound by, nor responsible for, any explanations, interpretations, clarifications, or qualifications of the Contract Document other than those given in written Addenda as specified in this paragraph. A BIDDER'S FAILURE TO FOLLOW THE PROCEDURE DESCRIBED IN THIS PARAGRAPH SHALL BE A BASIS FOR REJECTING ITS BID. No interpretation, clarification, qualification, amendment, or modification shall be valid unless set forth in an Addendum issued by the District. The District shall not be bound by, and hereby objects to, any term, condition or other provision which is different from or in addition to that contained in the Contract Document or the written Addenda.

PLEASE NOTE THAT ATTEMPTS BY ANY BIDDER TO QUALIFY ITS BID PROPOSAL BY SUBMITTING WITH IT "STANDARD CONDITIONS," "STANDARD TERMS," MODIFICATIONS TO THE GENERAL AND/OR SUPPLEMENTAL CONDITIONS, OR THE LIKE, WITHOUT COMPLYING WITH THE PROCEDURES SET OUT IN THE IMMEDIATELY PRECEDING PARAGRAPH MAY CONSTITUTE A BASIS FOR REJECTION OF THE BID. TO THE EXTENT ANY SUCH QUALIFICATIONS ACCOMPANY BIDDER'S BID PROPOSAL, THE DISTRICT SHALL BE ENTITLED TO CONSIDER THOSE STATEMENTS AS NULL, VOID AND OF NO EFFECT IN AWARD OF THE CONTRACT.

14. CHANGES TO CONTRACT DOCUMENTS

The District may revise or amend the Contract Documents any time prior to the bid opening by issuance of one or more written Addenda. Each Addendum will be deposited in the U.S. mail with postage prepaid and addressed to all prospective Bidders who have been furnished Contract Documents by the District and shall be construed as incorporated into the Contract Documents and shall become a part hereof.

At the District's discretion, the Addendum may be transmitted by Electronic Transmission. Bidder shall acknowledge receipt of each and every Addendum on the Bid Proposal form.

15. LAWS AND REGULATIONS

All applicable state and federal laws, municipal ordinances, administrative codes and the rules and regulations of all authorities having jurisdiction over the Project shall apply to the Contract throughout, and they will be deemed to be included in the Contract the same as though herein written out in full.

The Contract Documents and other writings of whatsoever nature which are a part of the Project shall be construed for all purposes solely and exclusively in accordance with and pursuant to the laws of the State of Washington. The rights and obligations of Bidders, the District, and Contractor shall be governed by the laws of the State of Washington. Contractor submits to the exclusive jurisdiction of the courts of the State of Washington. Venue for any lawsuit arising from these Contract Documents or Work performed under the Contract shall be in Chelan County Superior Court, Chelan County, Washington.

16. ENVIRONMENTAL LEGISLATION

Pursuant to RCW Title 39, the District is required in connection with all invitations for Bid Proposals for public improvement projects to make available, to the extent they are reasonably obtainable, those provisions of federal, state and local statutes, ordinances, and regulations dealing with the prevention of environmental pollution and the preservation of public natural resources that may affect or are affected by the Project. The Contractor will be expected to fully comply with this legislation and with all orders, permits, approvals, certifications, licenses, ordinances and regulations adopted thereunder and any other environmental legislation of which the Contractor is aware or shall subsequently become aware.

For more detailed information and copies of relevant environmental laws, prospective Bidders may contact the Licensing and Environmental Manager, Public Utility District No. 1 of Chelan County, P.O. Box 1231, Wenatchee, Washington 98807.

17. CONDITIONS OF WORK

Each Bidder must inform itself fully of all conditions relating to the work of the Project and the employment of labor thereon. Failure to do so will not relieve a successful Bidder (Contractor) of the provisions of its Contract. Insofar as possible, the Contractor, in carrying out its Work, must employ such methods or means as will not cause any interruption of or interference with the tasks being accomplished by the District or other

contractors and subcontractors in the same area or on the same improvement and/or Project to which these Contract Documents and the Work thereunder relate.

18. EXAMINATION OF SITE

Each Bidder shall thoroughly examine and be familiar with the site of the proposed Project and submission of a Proposal shall constitute an acknowledgment upon which the District may rely that the Bidder has thoroughly examined and is familiar with the site. Bidders must assume all responsibility for conclusions or assumptions which may be made as to the nature of materials to be excavated, the difficulties of making and maintaining the required excavation, and of doing other work affected by subsurface conditions at the site of the work. The failure or neglect of the Bidder to fully familiarize itself with the conditions at the Project site shall in no way relieve it of any obligations with respect to the Proposal or to the Contract. No claim for additional compensation will be allowed based upon lack of knowledge of the site. Information or assistance for field inspection of the site by interested Bidders may be obtained by contacting <<ProjectMgr>>, Public Utility District No. 1 of Chelan County, Wenatchee, Washington, at (509)661-<<ORIGINATOR_PHONE>>, or toll free at (888)663-8121, extension <<ORIGINATOR_PHONE>>.

19. EXCEPTIONS TO CONTRACT DOCUMENTS

The District shall reject a Bidder's Proposal if it contains terms or conditions that are materially different from those contained in these Contract Documents. The District may, at its option, consider a Bidder's Proposal if it contains terms or conditions that are immaterially different from those contained in these Contract Documents by waiving such irregularity as an informality.

A proposal to substitute materials, processes or articles that are, in the District's sole judgment and opinion, equal to those required by these Contract Documents may not be considered materially different terms or conditions. The Bidder shall provide to the District adequate documentation to support that the substituted material is equal.

Terms or conditions in the Bidder's Proposal that are different from those contained in these Contract Documents, regardless of whether they would immaterially alter these Contract Documents, shall not be binding on the District, and the District hereby objects thereto unless the District, in writing, expressly and specifically accepts such different terms and conditions.

20. QUALIFICATIONS OF BIDDER

Pursuant to RCW 39.06, the District shall not award the Contract to a Bidder who is not registered or licensed as may be required by Washington State law. The District may

make such investigations as it deems necessary to determine the ability of the Bidder to perform the Work, and the Bidder shall furnish to the District all such information and data for this purpose as the District may request. The District reserves the right to reject any bid if the evidence submitted by, or investigation of, such Bidder fails to satisfy the District that such Bidder is properly qualified to carry out the obligations of the Contract and to complete the Work contemplated therein.

IMPORTANT: Subcontractors are also subject to qualification by the District. See SECTION B, BIDDING INSTRUCTIONS, EVALUATION OF BIDS and SECTION C, GENERAL CONDITIONS, LEGAL, SUBCONTRACTS, of these Contract Documents.

21. SUBCONTRACTS

Each Bidder shall submit as part of the bid the names, addresses and telephone numbers of all Subcontractors with whom the Bidder, if awarded the Contract, will subcontract for the performance of the Work. Failure of the Bidder to name such Subcontractor(s) may render a Bidder's Bid nonresponsive and therefore void.

22. EVALUATION OF BIDS

In evaluating the bids, the following criteria, in addition to responsiveness of bid and Bid Price, will be considered:

- Experience, technical qualifications, skill, ability and capacity of the Bidder.
- Character and record of performance of the Bidder.
- Ability of the Bidder to perform the Contract within the time specified, taking into account all of the Bidder's existing business commitments.
- Thoroughness of Bidder's compliance with and completion of data requests to the extent it impacts the District's ability to compare Bid Proposals and verify compliance with Specifications.
- Qualifications and eligibility of Bidder to receive an award of the Contract under applicable laws and regulations.
- The financial qualifications of the Bidder.
- In accordance with RCW 43.19.1911, which authorizes consideration of bids with the lowest life cycle cost in evaluating bids for the purchase, manufacture or lease of materials, equipment or other goods, the District may consider and apply

Insert B (additional bullets) for Section B – Bidding Instruction; Page B-9; 22.
Evaluation of Bids

- Additional project construction costs specific to each pump and motor schedule, not included in Bid, required to construct an operating pump station including civil, electrical, structural, and mechanical design elements.
- Construction and operational risk factors for each pump and motor schedule.
- Configuration, interface and compactness of electrical system.
- Nearest repair or service organization for electrical and control equipment.

the "life cycle costing" technique where it will result in the lowest total cost to the District.

- Such other information as may be secured having a bearing on the decision to award the Contract, including but not limited to prior safety violations and lawsuits.

Additional evaluation criteria may be specified in SECTION D, SUPPLEMENTAL CONDITIONS, or elsewhere in these Contract Documents. The District hereby reserves the right to evaluate the Subcontractors listed by the Bidder to perform categories of Work under the terms of the Contract using the same or similar evaluation criteria that apply to the Bidders themselves and to reject a bid if one or more listed Subcontractors is objectionable to the District.

23. CONTRACT AWARD

The District reserves the right to reject any or all bids, and to waive any informality or immaterial irregularity in the bids received. The District reserves the right to let the Contract to the lowest responsible Bidder, whose bid will be most advantageous to the District, price and other factors considered.

The Contract award must comply with the State of Washington laws governing Public Utility Districts which provide that no Contract shall be let for more than 15% in excess of the District's estimated cost of the Work.

The acceptance of a Proposal will be evidenced by a Notice of Award in writing signed by an authorized representative of the District's Procurement and Contract Services Department and delivered to the Bidder whose Proposal is accepted. No other act of the District shall constitute acceptance of a Proposal. Timely acceptance of a Proposal shall obligate the Bidder whose Proposal is accepted to furnish a Performance and Payment Bond, Insurance Certificates, and execute the Contract set forth in these Contract Documents.

24. BID GUARANTY

When the District rejects all Bid Proposals, all cashier or certified checks and/or Bid Bonds will thereupon be returned to the Bidders. When a Bid Proposal is accepted, all cashier or certified checks and/or Bid Bonds will thereupon be returned to the Bidders, without interest, except the cashier or certified check or Bid Bond of the apparent lowest responsible Bidder may be retained until a Satisfactory Performance and Payment Bond and Insurance Certificate(s) are furnished, and the Contract is executed by the accepted Bidder.

Any Bidder whose Proposal is accepted shall execute the Notice of Award, furnish a Satisfactory Performance and Payment Bond and Insurance Certificates, and execute the Contract within ten (10) days after delivery of Notice of Award. Failure, neglect or refusal to do so shall constitute a breach of agreement to enter into the Contract effected by the Bidder's Proposal and the District's Notice of Award. The damages to the District for such a breach of agreement will include monetary loss for among other things, interference with the District's construction program and normal operations, the accurate amount of which is difficult or impossible to compute. The District has estimated and each Bidder, by submitting its Proposal, agrees that reasonable compensation for damages resulting from failure, neglect or refusal to furnish a Performance and Payment Bond and Insurance Certificate(s) and execute the Contract shall be 5% of the amount of the Bid Price, pursuant to SECTION B, BIDDING INSTRUCTIONS, BID BOND OR DEPOSIT.

In the event any Bidder whose Proposal is accepted fails, neglects, or refuses to furnish a Satisfactory Performance and Payment Bond and Insurance Certificate(s) and execute the Contract as herein provided, such failure, neglect or refusal shall constitute a breach of agreement to enter into the Contract and, at the option of the District, such agreement shall thereby be terminated and, notwithstanding such termination, the Bidder shall be liable for the aforesaid damages arising from such breach. In the event the District elects to declare a breach for such noncompliance, the defaulting Bidder shall not be the lowest responsible Bidder and the District may then select the lowest responsible Bidder and deliver a Notice of Award to such Bidder.

25. MATERIAL IDENTIFICATION

Bidders must furnish descriptions of the items they propose to furnish. Whenever in the Specifications any material, process or article is indicated or specified by patent, number, proprietary name or name of manufacturer or any combination of these, such Specification shall be deemed to be used for the purpose of facilitating description of the material, process or article desired and shall be deemed to be followed by the words "Or Equal." Any Bidder (and the Contractor) may offer in the bid (or after Contract award) any material, process or article which shall be equal in every material respect to that so indicated or specified, provided that if the material, process or article offered by the Contractor after Contract award is different from that in its Proposal and is not, in the opinion of the District, equal in every material respect, then the Contractor must furnish the material, process or article specified or one that in the opinion of the District is the equal thereof in every material respect. The District shall be the sole judge of the quality and suitability of the proposed substitution.

END OF SECTION B



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TABLE OF CONTENTS

1. RECEIPT AND OPENING OF BIDS	2
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5. DELAY IN RECEIPT OF PROPOSAL	3
6. WITHDRAWAL OF BIDS	3
7. BID PRICE	4
8. BID BOND OR DEPOSIT	4
9. PERFORMANCE AND PAYMENT BOND	5
10. TIME OF COMPLETION AND LIQUIDATED DAMAGES	5
11. EXAMINATION OF CONTRACT DOCUMENTS	5
12. INTENT OF CONTRACT DOCUMENTS	6
13. CLARIFICATION OF CONTRACT DOCUMENTS	6
14. CHANGES TO CONTRACT DOCUMENTS	6
15. LAWS AND REGULATIONS	7
16. ENVIRONMENTAL LEGISLATION	7
17. CONDITIONS OF WORK	7
18. EXAMINATION OF SITE	8
19. EXCEPTIONS TO CONTRACT DOCUMENTS	8
20. QUALIFICATIONS OF BIDDER	8
21. SUBCONTRACTS	9
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- Acknowledgment of receipt of Addenda to Contract Documents on Bid Proposal form.
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 - Time to complete shop work and field work (days).
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3. CLARIFICATION OF BID

Any Bidder may submit data to clarify its bid in a sealed envelope at any time prior to the scheduled closing time for receipt of bids. If clarification is submitted by Electronic Transmission, it shall be sent to an independent third party and that third party shall deliver said clarification to the District in a sealed envelope at any time prior to the scheduled closing time for receipt of bids. All such communications must be received by the District prior to the time set for bid opening. If clarification is submitted by Electronic Transmission to an independent third party, Bidder shall mail or send via private carrier or courier to the District, prior to time set for bid opening, written confirmation of the Electronic Transmission clarification or modification with the signature of the Bidder. The sole purpose of this provision is to allow Bidders to clarify any perceived ambiguity in the terms or conditions of their bid or supporting data or to add or delete any terms or conditions to their bid. If written confirmation is not received within five (5) days from the time set for bid opening, no consideration will be given to the modification.

4. EXTENSION OF DUE DATE

The District reserves the right to extend the time for receiving and opening bids. If the time is extended, notice of the extension(s) will be given prior to the originally specified due date to each entity which has been furnished copies of the Contract Documents by the District.

5. DELAY IN RECEIPT OF PROPOSAL

Any bid received after the time and date specified may be marked as to date and time received and returned to Bidder unopened by the District. If a bid arrives by mail after the opening time and is postmarked at the post office of the Bidder sufficiently in advance of bid opening time to have normally reached the District prior to bid opening, and it is determined by the District that nonarrival on time was due solely to delay in the mails for which the Bidder was not responsible, such bid may be considered. A similar policy will be followed with regard to bids submitted via private carrier or courier.

6. WITHDRAWAL OF BIDS

A Bidder may withdraw its bid before the time set for opening sealed bids, but may not do so once that time arrives. However, if the District extends the time for receiving and opening sealed bids (SECTION B, BIDDING INSTRUCTIONS, EXTENSION OF DUE DATE), a Bidder may withdraw its bid until the new time for opening bids arrives. In addition, a Bidder, regardless of whether the District selects it as the lowest responsible bidder, may not withdraw its bid during the time the Bid Proposal states the bid shall remain in force.



7. BID PRICE

The Bid Price shall be submitted on the forms contained in SECTION E, CONTRACT DOCUMENT FORMS, of these Contract Documents.

Bidder shall fill in all prices for the Work and for each Alternate in the appropriate spaces provided in the Bid Proposal form and Bid Price Schedule(s).

The Work covered by the Contract Documents may fall under the statutes of the State of Washington relating to public works and payment of prevailing rate of wage as more fully set forth in the General Conditions contained herein.

The cost of furnishing a 100% Performance and Payment Bond shall be quoted on the Bid Proposal form based on the Bid Price, inclusive of coverage for Washington State sales tax.

The Bid Price shall be all inclusive to include the furnishing of all labor, supervision, materials, tools, equipment, permits, all taxes (excluding Washington State sales tax on the Bid Price), licenses, insurance, overhead, profit, temporary construction, temporary facilities, cleanup and all miscellaneous items for the Work as required by the Contract Documents. The District will pay the Contractor for Washington State sales tax; this tax shall be shown as a separate item on invoices and will be paid on the basis of Work completed with no portion withheld for retainage.

8. BID BOND OR DEPOSIT

Each bid must be accompanied by a certified or cashier's check, payable to the order of Public Utility District No. 1 of Chelan County, Washington, for a sum of not less than 5% of the amount of the Bid Price or by a Bid Bond, in the form included in SECTION E, CONTRACT DOCUMENT FORMS, BID BOND OR DEPOSIT, of these Contract Documents, in an amount not less than 5% of the amount of the Bid Price, with a corporate surety licensed to do business in the State of Washington, and acceptable to the District. The Bid Bond amount shall be calculated on the base Bid Price without consideration of options, if any. The Bid Bond shall be accompanied by a certified copy of the power of attorney authorizing the attorney-in-fact of the corporate Surety to execute and deliver the Bond on behalf of the Surety, together with a currently executed certificate of an authorized officer of the Surety stating that the power of attorney is in full force and effect. The certified or cashier's check or Bid Bond of all Bidders will be returned without interest within five (5) days after the Contract has been awarded for execution to the successful Bidder, except that of the successful Bidder which shall be retained until the Contract is entered into and a bond to perform the Work, with Surety Satisfactory to the District, is furnished in accordance with the Contract Documents. The Bid Bond shall be at the expense of the Bidder. The amount of the certified or cashier's check, if furnished, or Bid Bond will be forfeited to the District as liquidated

damages unless the successful Bidder enters into a Contract in accordance with its bid within ten (10) days after it is notified that it is the successful Bidder. Bidders may file an annual Bid Bond in a form acceptable to the District to satisfy the Bid Bond requirement for any bid submitted by the Bidder during the applicable period of coverage.

9. PERFORMANCE AND PAYMENT BOND

The successful Bidder must, within ten (10) days after it is notified that it is the successful Bidder by the delivery of a Notice of Award, furnish a Performance and Payment Bond which must be submitted on the form included in SECTION E, CONTRACT DOCUMENT FORMS, of these Contract Documents. The Performance and Payment Bond shall be for 100% of the Contract Price unless otherwise specified in Supplemental Conditions, inclusive of coverage for Washington State sales tax. The Performance and Payment Bond shall extend through the warranty period, which Performance and Payment Bond shall be executed with a Satisfactory Surety and authorized to issue surety bonds in the State of Washington. The Performance and Payment Bond shall be accompanied by a certified copy of the power of attorney authorizing the attorney-in-fact of the corporate Surety to execute and deliver the Bond on behalf of the Surety, together with a currently executed certificate of an authorized officer of the Surety stating that the power of attorney is in full force and effect. The actual cost of the Performance and Payment Bond shall be borne by the successful Bidder. At the District's sole discretion, authorization may be given to Contractor to begin the Work while finalizing minor deficiencies in the Performance and Payment Bond; progress payment(s) may be withheld until the deficiency(ies) is corrected.

10. TIME OF COMPLETION AND LIQUIDATED DAMAGES

The Bidder shall base its bid upon the completion schedule included in the Contract Documents. Bidder (Contractor) agrees to commence Work on or before a date to be specified in a written Notice to Proceed issued by the District and to strictly comply with the completion schedule specified in the Contract Documents.

IMPORTANT: This Contract may contain a liquidated damages provision in SECTION D, SUPPLEMENTAL CONDITIONS, based on the completion schedule.

11. EXAMINATION OF CONTRACT DOCUMENTS

Each Bidder shall thoroughly examine and be familiar with the Contract Drawings, Specifications and other Contract Documents, and submission of a bid shall constitute an acknowledgment upon which the District may rely that the Bidder has thoroughly examined all Contract Documents. No claim for additional compensation will be allowed which is based upon a lack of knowledge of the Contract Documents.

12. INTENT OF CONTRACT DOCUMENTS

All provisions of the Contract Documents are intended to be mutually cooperative and anything required in one and omitted from another shall be as binding as if called for in all, and in the event of a conflict in provisions, the Work shall be done in the manner most satisfactory to the District. It is the intent of the Contract Documents to include every requisite and necessity to properly furnish the entire Work, notwithstanding the fact that every item necessarily involved may not be particularly mentioned. All Work, when finished, shall be complete and in undamaged condition.

13. CLARIFICATION OF CONTRACT DOCUMENTS

If a Bidder requires clarification of the Contract Documents, the Bidder shall at once forward to the District a written request for interpretation, clarification, or qualification before submitting its bid. The Bidder making this request is solely responsible for its timely receipt. The District will reply only in the form of written Addenda. The District shall neither be bound by, nor responsible for, any explanations, interpretations, clarifications, or qualifications of the Contract Document other than those given in written Addenda as specified in this paragraph. A BIDDER'S FAILURE TO FOLLOW THE PROCEDURE DESCRIBED IN THIS PARAGRAPH SHALL BE A BASIS FOR REJECTING ITS BID. No interpretation, clarification, qualification, amendment, or modification shall be valid unless set forth in an Addendum issued by the District. The District shall not be bound by, and hereby objects to, any term, condition or other provision which is different from or in addition to that contained in the Contract Document or the written Addenda.

PLEASE NOTE THAT ATTEMPTS BY ANY BIDDER TO QUALIFY ITS BID PROPOSAL BY SUBMITTING WITH IT "STANDARD CONDITIONS," "STANDARD TERMS," MODIFICATIONS TO THE GENERAL AND/OR SUPPLEMENTAL CONDITIONS, OR THE LIKE, WITHOUT COMPLYING WITH THE PROCEDURES SET OUT IN THE IMMEDIATELY PRECEDING PARAGRAPH MAY CONSTITUTE A BASIS FOR REJECTION OF THE BID. TO THE EXTENT ANY SUCH QUALIFICATIONS ACCOMPANY BIDDER'S BID PROPOSAL, THE DISTRICT SHALL BE ENTITLED TO CONSIDER THOSE STATEMENTS AS NULL, VOID AND OF NO EFFECT IN AWARD OF THE CONTRACT.

14. CHANGES TO CONTRACT DOCUMENTS

The District may revise or amend the Contract Documents any time prior to the bid opening by issuance of one or more written Addenda. Each Addendum will be deposited in the U.S. mail with postage prepaid and addressed to all prospective Bidders who have been furnished Contract Documents by the District and shall be construed as incorporated into the Contract Documents and shall become a part hereof.



At the District's discretion, the Addendum may be transmitted by Electronic Transmission. Bidder shall acknowledge receipt of each and every Addendum on the Bid Proposal form.

15. LAWS AND REGULATIONS

All applicable state and federal laws, municipal ordinances, administrative codes and the rules and regulations of all authorities having jurisdiction over the Project shall apply to the Contract throughout, and they will be deemed to be included in the Contract the same as though herein written out in full.

The Contract Documents and other writings of whatsoever nature which are a part of the Project shall be construed for all purposes solely and exclusively in accordance with and pursuant to the laws of the State of Washington. The rights and obligations of Bidders, the District, and Contractor shall be governed by the laws of the State of Washington. Contractor submits to the exclusive jurisdiction of the courts of the State of Washington. Venue for any lawsuit arising from these Contract Documents or Work performed under the Contract shall be in Chelan County Superior Court, Chelan County, Washington.

16. ENVIRONMENTAL LEGISLATION

Pursuant to RCW Title 39, the District is required in connection with all invitations for Bid Proposals for public improvement projects to make available, to the extent they are reasonably obtainable, those provisions of federal, state and local statutes, ordinances, and regulations dealing with the prevention of environmental pollution and the preservation of public natural resources that may affect or are affected by the Project. The Contractor will be expected to fully comply with this legislation and with all orders, permits, approvals, certifications, licenses, ordinances and regulations adopted thereunder and any other environmental legislation of which the Contractor is aware or shall subsequently become aware.

For more detailed information and copies of relevant environmental laws, prospective Bidders may contact the Licensing and Environmental Manager, Public Utility District No. 1 of Chelan County, P.O. Box 1231, Wenatchee, Washington 98807.

17. CONDITIONS OF WORK

Each Bidder must inform itself fully of all conditions relating to the work of the Project and the employment of labor thereon. Failure to do so will not relieve a successful Bidder (Contractor) of the provisions of its Contract. Insofar as possible, the Contractor, in carrying out its Work, must employ such methods or means as will not cause any interruption of or interference with the tasks being accomplished by the District or other



contractors and subcontractors in the same area or on the same improvement and/or Project to which these Contract Documents and the Work thereunder relate.

18. EXAMINATION OF SITE

Each Bidder shall thoroughly examine and be familiar with the site of the proposed Project and submission of a Proposal shall constitute an acknowledgment upon which the District may rely that the Bidder has thoroughly examined and is familiar with the site. Bidders must assume all responsibility for conclusions or assumptions which may be made as to the nature of materials to be excavated, the difficulties of making and maintaining the required excavation, and of doing other work affected by subsurface conditions at the site of the work. The failure or neglect of the Bidder to fully familiarize itself with the conditions at the Project site shall in no way relieve it of any obligations with respect to the Proposal or to the Contract. No claim for additional compensation will be allowed based upon lack of knowledge of the site. Information or assistance for field inspection of the site by interested Bidders may be obtained by contacting <<ProjectMgr>>, Public Utility District No. 1 of Chelan County, Wenatchee, Washington, at (509)661-<<ORIGINATOR_PHONE>>, or toll free at (888)663-8121, extension <<ORIGINATOR_PHONE>>.

19. EXCEPTIONS TO CONTRACT DOCUMENTS

The District shall reject a Bidder's Proposal if it contains terms or conditions that are materially different from those contained in these Contract Documents. The District may, at its option, consider a Bidder's Proposal if it contains terms or conditions that are immaterially different from those contained in these Contract Documents by waiving such irregularity as an informality.

A proposal to substitute materials, processes or articles that are, in the District's sole judgment and opinion, equal to those required by these Contract Documents may not be considered materially different terms or conditions. The Bidder shall provide to the District adequate documentation to support that the substituted material is equal.

Terms or conditions in the Bidder's Proposal that are different from those contained in these Contract Documents, regardless of whether they would immaterially alter these Contract Documents, shall not be binding on the District, and the District hereby objects thereto unless the District, in writing, expressly and specifically accepts such different terms and conditions.

20. QUALIFICATIONS OF BIDDER

Pursuant to RCW 39.06, the District shall not award the Contract to a Bidder who is not registered or licensed as may be required by Washington State law. The District may

make such investigations as it deems necessary to determine the ability of the Bidder to perform the Work, and the Bidder shall furnish to the District all such information and data for this purpose as the District may request. The District reserves the right to reject any bid if the evidence submitted by, or investigation of, such Bidder fails to satisfy the District that such Bidder is properly qualified to carry out the obligations of the Contract and to complete the Work contemplated therein.

IMPORTANT: Subcontractors are also subject to qualification by the District. See SECTION B, BIDDING INSTRUCTIONS, EVALUATION OF BIDS and SECTION C, GENERAL CONDITIONS, LEGAL, SUBCONTRACTS, of these Contract Documents.

21. SUBCONTRACTS

Each Bidder shall submit as part of the bid the names, addresses and telephone numbers of all Subcontractors with whom the Bidder, if awarded the Contract, will subcontract for the performance of the Work. Failure of the Bidder to name such Subcontractor(s) may render a Bidder's Bid nonresponsive and therefore void.

22. EVALUATION OF BIDS

In evaluating the bids, the following criteria, in addition to responsiveness of bid and Bid Price, will be considered:

- Experience, technical qualifications, skill, ability and capacity of the Bidder.
- Character and record of performance of the Bidder.
- Ability of the Bidder to perform the Contract within the time specified, taking into account all of the Bidder's existing business commitments.
- Thoroughness of Bidder's compliance with and completion of data requests to the extent it impacts the District's ability to compare Bid Proposals and verify compliance with Specifications.
- Qualifications and eligibility of Bidder to receive an award of the Contract under applicable laws and regulations.

The financial qualifications of the Bidder.

- In accordance with RCW 43.19.1911, which authorizes consideration of bids with the lowest life cycle cost in evaluating bids for the purchase, manufacture or lease of materials, equipment or other goods, the District may consider and apply

Insert B (additional bullets) for Section B – Bidding Instruction; Page B-9; 22.
Evaluation of Bids

- Additional project construction costs specific to each pump and motor schedule, not included in Bid, required to construct an operating pump station including civil, electrical, structural, and mechanical design elements.
- Construction and operational risk factors for each pump and motor schedule.
- Configuration, interface and compactness of electrical system.
- Nearest repair or service organization for electrical and control equipment.

the "life cycle costing" technique where it will result in the lowest total cost to the District.

- Such other information as may be secured having a bearing on the decision to award the Contract, including but not limited to prior safety violations and lawsuits.

Additional evaluation criteria may be specified in SECTION D, SUPPLEMENTAL CONDITIONS, or elsewhere in these Contract Documents. The District hereby reserves the right to evaluate the Subcontractors listed by the Bidder to perform categories of Work under the terms of the Contract using the same or similar evaluation criteria that apply to the Bidders themselves and to reject a bid if one or more listed Subcontractors is objectionable to the District.

23. CONTRACT AWARD

The District reserves the right to reject any or all bids, and to waive any informality or immaterial irregularity in the bids received. The District reserves the right to let the Contract to the lowest responsible Bidder, whose bid will be most advantageous to the District, price and other factors considered.

The Contract award must comply with the State of Washington laws governing Public Utility Districts which provide that no Contract shall be let for more than 15% in excess of the District's estimated cost of the Work.

The acceptance of a Proposal will be evidenced by a Notice of Award in writing signed by an authorized representative of the District's Procurement and Contract Services Department and delivered to the Bidder whose Proposal is accepted. No other act of the District shall constitute acceptance of a Proposal. Timely acceptance of a Proposal shall obligate the Bidder whose Proposal is accepted to furnish a Performance and Payment Bond, Insurance Certificates, and execute the Contract set forth in these Contract Documents.

24. BID GUARANTY

When the District rejects all Bid Proposals, all cashier or certified checks and/or Bid Bonds will thereupon be returned to the Bidders. When a Bid Proposal is accepted, all cashier or certified checks and/or Bid Bonds will thereupon be returned to the Bidders, without interest, except the cashier or certified check or Bid Bond of the apparent lowest responsible Bidder may be retained until a Satisfactory Performance and Payment Bond and Insurance Certificate(s) are furnished, and the Contract is executed by the accepted Bidder.



Section B Bidding Instructions

Any Bidder whose Proposal is accepted shall execute the Notice of Award, furnish a Satisfactory Performance and Payment Bond and Insurance Certificates, and execute the Contract within ten (10) days after delivery of Notice of Award. Failure, neglect or refusal to do so shall constitute a breach of agreement to enter into the Contract effected by the Bidder's Proposal and the District's Notice of Award. The damages to the District for such a breach of agreement will include monetary loss for among other things, interference with the District's construction program and normal operations, the accurate amount of which is difficult or impossible to compute. The District has estimated and each Bidder, by submitting its Proposal, agrees that reasonable compensation for damages resulting from failure, neglect or refusal to furnish a Performance and Payment Bond and Insurance Certificate(s) and execute the Contract shall be 5% of the amount of the Bid Price, pursuant to SECTION B, BIDDING INSTRUCTIONS, BID BOND OR DEPOSIT.

In the event any Bidder whose Proposal is accepted fails, neglects, or refuses to furnish a Satisfactory Performance and Payment Bond and Insurance Certificate(s) and execute the Contract as herein provided, such failure, neglect or refusal shall constitute a breach of agreement to enter into the Contract and, at the option of the District, such agreement shall thereby be terminated and, notwithstanding such termination, the Bidder shall be liable for the aforesaid damages arising from such breach. In the event the District elects to declare a breach for such noncompliance, the defaulting Bidder shall not be the lowest responsible Bidder and the District may then select the lowest responsible Bidder and deliver a Notice of Award to such Bidder.

25. MATERIAL IDENTIFICATION

Bidders must furnish descriptions of the items they propose to furnish. Whenever in the Specifications any material, process or article is indicated or specified by patent, number, proprietary name or name of manufacturer or any combination of these, such Specification shall be deemed to be used for the purpose of facilitating description of the material, process or article desired and shall be deemed to be followed by the words "Or Equal." Any Bidder (and the Contractor) may offer in the bid (or after Contract award) any material, process or article which shall be equal in every material respect to that so indicated or specified, provided that if the material, process or article offered by the Contractor after Contract award is different from that in its Proposal and is not, in the opinion of the District, equal in every material respect, then the Contractor must furnish the material, process or article specified or one that in the opinion of the District is the equal thereof in every material respect. The District shall be the sole judge of the quality and suitability of the proposed substitution.

END OF SECTION B

SECTION C

GENERAL CONDITIONS

TABLE OF CONTENTS

1. DEFINITIONS	3
2. WAIVER.....	9
3. ACCESS TO RECORDS	9
4. CORPORATE AUTHORITY; BINDING SIGNATURES	10
5. DRAWINGS AND SPECIFICATIONS.....	10
5.1. INTENT OF DOCUMENTS	10
5.2. CONFLICT AND PRECEDENCE.....	10
5.3. CLARIFICATION OF CONTRACT DOCUMENTS.....	11
5.4. OWNERSHIP OF ENGINEERING DATA AND OTHER INFORMATION	11
5.5. WORK PRODUCT	12
5.6. COPYRIGHT.....	12
5.7. CONTRACT DRAWINGS AND INSTRUCTIONS.....	12
5.8. CONTRACTOR'S COPIES OF DRAWINGS AND SPECIFICATIONS.....	13
5.9. REFERENCED STANDARDS & SPECIFICATIONS	13
5.10. MATERIALS AND EQUIPMENT FURNISHED BY DISTRICT.....	14
5.11. WORKMANSHIP OF CONTRACTOR	14
5.12. COMPLIANCE WITH SPECIFICATIONS	15
5.13. STORAGE OF MATERIALS AND EQUIPMENT	16
5.14. INSPECTION, ACCESS AND REJECTED WORK.....	16
5.15. STOP WORK DIRECTIVE	17
6. LEGAL	18
6.1. WARRANTY.....	18
6.2. INDEMNITY	19
6.3. SUBCONTRACTS	20
6.4. TRADE JURISDICTION AND APPRENTICE WORKERS.....	21
6.5. CONTRACTOR'S DEFAULT	21
6.6. CONTRACTOR'S CLAIMS	23
6.7. NOTICES	24
6.8. TERMINATION FOR CONVENIENCE.....	24
6.9. ASSIGNMENT OF CONTRACT.....	25
6.10. PATENTS AND ROYALTIES	26
6.11. PERMITS	26
6.12. LIABILITIES OF THE CONTRACTOR.....	26
6.13. APPLICABLE LAW/COURT COSTS/ATTORNEYS FEES.....	28
6.14. COMPLIANCE WITH LAWS	29
7. INSURANCE.....	29
7.1. MINIMUM INSURANCE REQUIREMENTS	29
7.2. ADDITIONAL INSURANCE CONDITIONS.....	30
7.3. CERTIFICATION AND CANCELLATION OF INSURANCE	31

7.4. WORKERS COMPENSATION INSURANCE	32
7.5. INSURANCE SHALL NOT LIMIT LIABILITY.....	32
8. PROGRESS AND COMPLETION	32
8.1. NOTICE TO PROCEED	32
8.2. TIME FOR PERFORMANCE OF WORK	32
8.3. PRECONSTRUCTION CONFERENCE.....	33
8.4. PROGRESS, ORGANIZATION AND FACILITIES.....	33
8.5. WORK SCHEDULE	33
8.6. CHANGES IN THE WORK/FIELD WORK ORDER/CHANGE ORDERS	34
8.7. DELAYS AND EXTENSIONS OF TIME.....	35
8.8. SUSPENSION OF WORK	37
8.9. USE OF COMPLETED PORTIONS.....	37
9. PAYMENT.....	37
9.1. WAGES PAID BY CONTRACTOR	37
9.2. TIME AND MANNER OF PAYMENT TO CONTRACTOR.....	38
9.3. PAYMENTS BY CONTRACTOR	40
9.4. DETERMINATION OF QUANTITIES FOR PAYMENT	41
9.5. PAYMENT FOR UNCORRECTED WORK	41
9.6. PAYMENTS WITHHELD (RETAINAGE).....	41
9.7. ACCEPTANCE AND FINAL PAYMENT.....	42
9.8. CONTRACT COMPLETION	44
9.9. TAXES	44
10. DISTRICT OPERATIONS.....	44
10.1. DISTRICT OPERATIONS	44
10.2. DISTRICT CONSTRUCTION.....	45
10.3. MODIFICATION OF WORK SCHEDULE	45
11. PROJECT SITE MANAGEMENT AND SAFETY	45
11.1. CONTRACTOR'S SUPERINTENDENCE	45
11.2. LANDS PROVIDED BY DISTRICT	45
11.3. FACILITIES PROVIDED BY CONTRACTOR	46
11.4. SURVEYS	46
11.5. PROTECTION OF PROPERTY	46
11.6. SAFETY REQUIREMENTS	47
11.7. DUST AND SMOKE CONTROL	49
11.8. CLEANUP	50
11.9. SANITARY PROVISIONS	50
11.10. SECURITY	50
11.11. DRUG FREE WORKPLACE	51
11.12. VIOLENCE IN THE WORKPLACE	51
11.13. WORKER'S RIGHT-TO-KNOW	52

SECTION C

GENERAL CONDITIONS

1. DEFINITIONS

The following definitions apply throughout these Contract Documents when the term or phrase is capitalized, unless the context clearly requires otherwise:

ACT OF GOD - Earthquake, flood, cyclone or other cataclysmic phenomenon of nature. A rain, windstorm, high water or other natural phenomenon of unusual intensity for a specific locality, but which might reasonably have been anticipated from historical records of the general locality, shall not be construed as an "Act of God" and no payment shall be made to the Contractor for damages to the Work or delays resulting therefrom.

ADDENDA – The written notices of modification or clarification of the Contract Drawings, Specifications, or other Contract Documents, which may be issued by the District to holders of Contract Documents prior to the opening of Bid Proposals. The singular of Addenda is Addendum.

APPROVED - Approval by the Engineer or Architect, and by appropriate government officials according to applicable codes, and consistent with any quality standards applicable to the Work in question.

ARCHITECT - The person or entity or its authorized representative employed by the District that is lawfully licensed to practice architecture.

AS-BUILT DRAWINGS - A marked set of prints prepared by the Contractor or the District Project representative in the field. They are Contract Drawing prints upon which the Contractor or inspector records all variations between the Work as it was reported by the Contractor as having been actually constructed and the Work as it was shown in the original Contract Drawings as they existed at the time the Contract was awarded. All Field Work Order/Change Orders should be reflected in appropriate marks on the As-built Drawings.

AS DIRECTED - Direction given to the Contractor by the Project Engineer.

AS REQUIRED - Applicable codes or standards and/or as may be required for Satisfactory completion of the Work.

BIDDER - The person, entity or corporation that submits a Bid Proposal to the District for consideration and evaluation pursuant to the appropriate Advertisement for Bids and Contract Documents.

BID BOND - The approved surety bond form as provided in SECTION E, CONTRACT DOCUMENT FORMS, submitted by a Bidder and its Surety along with the Bid Proposal in satisfaction of RCW 54.04.080 and to guarantee payment of liquidated damages for failure or refusal of the successful Bidder to enter into a Contract with the District following Notice of Award of bid.

BID PRICE(S) - The sum(s) stated on the Bidder's Bid Proposal for which the Bidder offers to enter into a Contract with the District for the Work identified in the Contract Documents.

BID PRICE SCHEDULE - The lump sum or unit prices, as appropriate, specified on the form in SECTION E, CONTRACT DOCUMENT FORMS, which sets forth the Bidder's total Bid Price.

BID PROPOSAL - The written offer by the Bidder to perform the Work under the conditions specified on the Bid Proposal form set forth at SECTION E, CONTRACT DOCUMENT FORMS, of the Contract Documents.

COMPLETION - Completion of all Contract Work, which is the last date on which Work was performed to complete the public improvement(s) specified in the Contract Documents to the reasonable satisfaction of the Engineer.

CONTRACT - The signed agreement covering the furnishing of the Work and payment therefore described in SECTION E, CONTRACT DOCUMENT FORMS, of these Contract Documents and all legal obligations created by execution of said agreement.

CONTRACT DOCUMENTS - All of the following documents included as the various parts of the Contract between the District and the Contractor:

- Advertisement for Bids
- Bidding Instructions
- Bid Proposal
- Bid Price Schedule
- Bidder's Data
- Performance and Payment Bond
- Contract
- General Conditions
- Supplemental Conditions
- Specifications
- Addenda
- Contract Drawings
- Field Work Order/Change Orders

The table of contents, titles, headings, running headlines and marginal notes contained herein and in said documents are solely to facilitate reference to various provisions of the Contract Documents and in no way affect, limit, or cast light on the interpretation of the provisions to which they refer.

CONTRACT DRAWINGS - A pictorial description of the Work to be furnished or copies thereof, which is included as a part of the Contract Documents, as modified by Addenda, and/or Field Work Order/Change Orders to the Contract. "Contract Drawings" shall include the drawings issued to Bidders to delineate the scope of Work and "Construction Drawings" issued to the Contractor during Work to further describe the details of design. Only those drawings prepared on the standard title block sheet of the District shall be "Contract Drawings."

CONTRACT PRICE - The total sum stated on the Contract, including the cost of the required Performance and Payment Bond, but excluding Washington State sales tax, as adjusted by any Field Work Order/Change Orders, for which the Contractor agrees to perform all Work required by the Contract Documents.

CONTRACT TIME - The time designated in the Contract Documents for Completion of all Work on the Project required by the Contract Documents. The Contract Time may be modified only by Field Work Order/Change Order. Unless otherwise specified in these Contract Documents, the Contract Time shall begin from the date specified on the Notice to Proceed.

CONTRACTOR - The entity, person, firm or corporation whose Bid Proposal has been accepted by the District and who, together with the District, has executed the Contract to perform all Work required by the Contract Documents.

CONTRACTOR SUPERINTENDENT - The person who is assigned by the Contractor to perform, as set forth in SECTION C, GENERAL CONDITIONS, PROJECT SITE MANAGEMENT AND SAFETY, CONTRACTOR'S SUPERINTENDENCE, the Superintendence duties as necessary to furnish the Work required under the Contract.

DISTRICT - Public Utility District No. 1 of Chelan County headquartered in Wenatchee, Washington.

DOLLARS - United States currency.

EFFECTIVE DATE - The date upon which the Contract, Addendum, Field Work Order/Change Order, or other official document takes effect.

ELECTRONIC TRANSMISSION - Telefacsimile, electronic mail, or other means of electronic transmission available to and satisfactory to the District to transmit documents or communications.

ENGINEER'S INSTRUCTION - A written statement and/or Construction Drawing delivered to the Contractor by the Engineer which directs the Contractor to perform any act or acts related to the Project or clarifies an issue concerning the Drawings or Specifications.

ENGINEER, PROJECT ENGINEER OR PROJECT MANAGER - The principal or authorized person designated by the District to be responsible for the inspection, measurement, and testing of the Work for the District.

EXPERIENCE MODIFICATION RATE (EMR) - The rate available through Labor and Industries OSHA 200/300 forms that compares claim profiles that would be expected of an employer of similar size in the same industry. A value of 1.00 is average, meaning the frequency and severity of actual losses equaled the expected losses. A rate greater than 1.00 means the employer experiences worse than expected losses during the rating period. A rate less than 1.00 indicates the employer's losses were better than expected for the rating period. The rate is calculated using claims data from the three (3) most recently completed years excluding the expiring term.

FIELD WORK ORDER/CHANGE ORDER - A directive by the District made pursuant to SECTION C, GENERAL CONDITIONS, PROGRESS AND COMPLETION, CHANGES IN THE WORK/FIELD WORK ORDER/CHANGE ORDERS, or written supplemental agreement entered into by the District and the Contractor to modify the Contract after its execution, with or without notice to Surety. The signature of the Contractor is not required for a directive. Such Field Work Order/Change Order must be authorized in writing by the District's Commission or, if for an amount within the authority granted by the Commission, by a District employee.

HAZARDOUS CHEMICAL - Any chemical which poses a physical or health hazard.

HOLD POINT - A mandatory verification point identified within the Inspection and Acceptance Test Plan, or otherwise provided by the Project Engineer, beyond which Work shall not proceed until mandatory verification is performed and written authorization is granted by the Inspector.

INSPECTION and ACCEPTANCE TEST PLAN - A document identifying methods and sequence for inspection of the Work, including frequency of inspection, characteristics to be inspected, data to be recorded, and referenced acceptance criteria. This Plan may include mandatory Witness Points and Hold Points, as defined herein.

INSPECTORS - Those individuals designated by the District to inspect the Work under the direction of the Project Engineer.

INSURANCE CERTIFICATE - A written verification from an insurance company authorized to issue insurance in the State of Washington verifying that the Contractor

has obtained all insurance coverage required by these Contract Documents. This term shall include any and all attachments necessary to demonstrate compliance with all insurance conditions required by these Contract Documents, including the Insurance Coverage Checklist at SECTION E, CONTRACT DOCUMENT FORMS.

NOTICE OF AWARD - Written notification to the successful Bidder of the District's acceptance of the bid of said Bidder. A sample form can be found at SECTION E, CONTRACT DOCUMENT FORMS.

NOTICE TO PROCEED - Written notification from the District to the Contractor, in the general form set forth in SECTION E, CONTRACT DOCUMENT FORMS, instructing the Contractor to commence the Work and stating the Completion date, if applicable.

OR EQUAL - Contractor-proposed substitution of specific materials or processes that are deemed by the District, in its sole discretion, to be equal in every material respect to that specified in the Contract Documents.

OWNER - Synonymous with the term "District".

PERFORMANCE AND PAYMENT BOND

"Payment Bond" - the District approved surety bond form furnished by the Contractor and its Surety as a guaranty for the payment and protection of all Subcontractors, companies, and persons supplying labor, materials, equipment or professional services in the prosecution of the Work as defined in the Contract Documents.

"Performance Bond" - the District approved surety bond form furnished by the Contractor and its Surety as a guaranty that the Contractor will execute, furnish, and guarantee the Work and perform all of the requirements of the Contract.

Note: The District's approved bond form(s) is set forth at SECTION E, CONTRACT DOCUMENT FORMS.

PROJECT - The structure(s) or improvement(s) to be constructed or materials to be furnished and delivered, in whole or in part, through the performance of the Work specified in the Contract.

PROVIDE - To furnish, deliver and install.

REQUEST FOR PAYMENT - A written statement from the Contractor to the District requesting payment of some or all of the Contract Price and sales or use taxes for Work completed. A Request for Payment shall be prepared and processed in accordance with SECTION C, GENERAL CONDITIONS, PAYMENT. The District's specific form to be completed by the Contractor as a Request for Payment is set forth in SECTION E,

CONTRACT DOCUMENT FORMS, as "Contractor's Application and Certificate for Payment".

SATISFACTORY - Satisfactory to the District.

SHOP DRAWING - A pictorial or other description of the details of proposed materials, equipment, methods of installation or other Work prepared by the Contractor or a Subcontractor and submitted for the approval of the District.

SPECIFICATIONS/TECHNICAL SPECIFICATIONS - The technical, engineering and manufacturing descriptions of the Work to be furnished which are included as a part of the Contract Documents as modified by Addenda, and/or Field Work Order/Change Orders to the Contract.

STOP WORK DIRECTIVE - A written statement delivered to the Contractor which directs the Contractor to discontinue work on all or portions of the Work.

SUBCONTRACTOR - Any person, entity or corporation, other than an employee of the Contractor, supplying any Work in connection with the Contract pursuant to an agreement with either the Contractor or any Subcontractor of the Contractor.

SUBSTANTIAL COMPLETION - When the Contract Work has progressed to the extent that the District has full use and benefit of the facilities, both from the operational and safety standpoint, and only minor incidental work, replacement of temporary substitute facilities, or correction or repair remains to physically complete the total Contract, the Engineer may determine the Contract Work is substantially complete.

SUPERINTENDENCE - The general and detailed direction and management by the Contractor as necessary to furnish the Work required under the Contract, whether at the Project site or at other locations.

SUPPLY CONTRACTOR - Any person, entity or corporation who furnishes any Work directly to the District under another contract in connection with the Project.

SURETY - The person, entity or corporation who assumes the obligations of a surety by executing a surety bond (or bonds) payable to the District and to other indemnitees, as applicable, guaranteeing one or more of the following: the successful Bidder will execute a Contract, provide a Performance and Payment Bond as may be required by the Contract Documents, performance of the Contract either in whole or in part, and payment in full to all Subcontractors and laborers, materialmen, mechanics and suppliers to the Contractor and any Subcontractor.

UNIT PRICE - The amount bid by the Contractor for furnishing one (1) unit of Work when such units are furnished in the approximate quantities estimated, such quantities being subject to reasonable adjustment at such price.

WITNESS POINT - A mandatory notification point in the sequence of Work, as shown in the Inspection and Acceptance Test Plan, or otherwise provided by the Project Engineer, where notification to the Inspector is required for observation or examination of a specific work, an operation, or a test. Work may proceed beyond a Witness Point with or without inspection action, following written notification to the District.

WORK - All construction management, Superintendence, labor, materials, equipment and all component parts thereof, transportation and other facilities or services necessary to complete Contractor's obligations as specified in the Contract Documents and completion by Contractor of all documentation necessary per Contract Documents.

2. WAIVER

No waiver or modification of any provision of the Contract Documents shall be valid and binding upon the District unless the waiver or modification is in writing and signed by the District's Project Engineer with proper authority. A waiver shall neither be nor be construed to be a waiver of any past or future default or breach, nor a modification of any of the terms or conditions of the Contract, except to the extent expressly stated in the written waiver.

The failure of the District to insist upon strict performance of any term or provision of the Contract Documents shall not constitute a waiver or relinquishment of any such term or provision but the same shall be and remain in full force and effect. The making of any payment by the District to the Contractor with or without knowledge of any breach of the Contract shall not be deemed to be a waiver of any breach or of any term or provision of the Contract Documents.

3. ACCESS TO RECORDS

The District and other authorized representatives of the State of Washington shall have access to any book, document, paper, and record of the Contractor which are pertinent to this Contract for the purposes of making audits, examination, excerpt, and transcriptions.

All such records and all other records pertinent to this Contract and work undertaken pursuant to this Contract shall be retained by the Contractor for a period of six (6) years after the final acceptance of the Work pursuant to this Contract, unless a longer period is required to resolve audit findings or litigation. In such cases, the District may request, and the Contractor shall abide by, such longer period for record retention.

4. CORPORATE AUTHORITY; BINDING SIGNATURES

Each of the individuals executing this Contract or any document required by the Contract Documents on behalf of the Contractor warrants they are an authorized signatory of the entity for which they are signing, and have sufficient corporate authority to execute this Contract.

5. DRAWINGS AND SPECIFICATIONS

5.1. INTENT OF DOCUMENTS

5.1.1. Except as otherwise specifically provided in SECTION D, SUPPLEMENTAL CONDITIONS, the intent of the Contract Documents is to include all facilities, materials, equipment, supplies, management, Superintendence, labor, transportation, fuel, power, water and other utilities and all other services necessary for the proper performance of the Contract and the furnishing of all Work. It is the intent of the Contract Documents to specify and set forth a complete operational unit or system ready for use regardless of whether or not every detail has been set forth in the Contract Documents.

5.1.2. Any omission of details from the Contract Documents shall not be construed to mean that they are to be omitted by the Contractor or to affect in any way the completeness of the Work. The cost of such details shall be included in the Contract Price.

5.1.3. When materials, methods, labor or equipment are described in words which when so applied have well-known or technical trade meanings, these descriptions shall be held to refer to such meanings.

5.1.4. As a convenience to the Contractor and when appropriate, the Contract Documents attempt to show the approximate location of existing underground utilities and items to the extent that they are known, but neither the District nor the Engineer can or does purport to know or guarantee that all such utilities and items are shown or that indicated locations are accurate. The Contractor is to determine the exact location of all utilities and buried lines in the field. The Contractor shall call the Northwest Utility Notification Center before digging.

5.2. CONFLICT AND PRECEDENCE

The Contract Documents are complementary and what is called for by any one of them shall be as binding as if called for by all. In the event there are any conflicting provisions or requirements in the component parts of the Contract, the Contract Documents shall take precedence in the following order:

- Field Work Order/Change Orders
- Contract
- Addenda
- Supplemental Conditions
- General Conditions
- Specifications
- Contract Drawings
- Invitation and Instructions to Bidders
- Bid Proposal and Bid Price Schedules
- Performance and Payment Bond

The District shall not be bound by and rejects any terms, conditions or provisions submitted after the Effective Date of the Contract unless agreed to in writing by the District.

5.3. CLARIFICATION OF CONTRACT DOCUMENTS

5.3.1. If, in the course of the Work, the Contractor requires clarification of the Contract Documents, Contract Drawings or Specifications, the Contractor shall immediately inform the Engineer in writing. The Engineer will promptly review the request for clarification and, if necessary, issue additional information or an Engineer's Instruction or the District may issue a Field Work Order/Change Order. Any Work done after such discovery and until receipt of additional information, Engineer's Instruction, or Field Work Order/Change Order shall be at the Contractor's expense.

5.3.2. To avoid any disputes which might arise as to the meaning of anything contained in the Contract Documents, or any alleged error, omission or discrepancy therein, the Engineer's opinion as to the true intent and meaning, and the Engineer's interpretations thereof, shall be binding and final. All dimensions shall be taken from figures on the drawings and no dimensions measured from the drawings shall be valid. In the event dimensions are omitted, Work shall not be started until the necessary dimensions have been obtained from the Engineer in writing or on a Construction Drawing. In reading sizes, distances, angles, slopes and other measurements on drawings, the values used shall be those given in dimensions and figures and shall not be obtained by scaling.

5.4. OWNERSHIP OF ENGINEERING DATA AND OTHER INFORMATION

All designs, design criteria, Contract Drawings, Specifications, computations, estimates, survey notes and other data prepared for this Project, whether prepared by the District or the Contractor, shall be the property of the District. Such data shall not be duplicated or used for other work by the Contractor.

5.5. WORK PRODUCT

All data, designs, drawings, calculations, information obtained, materials information and the results of all Work performed by Contractor hereunder in written, electronic or other form shall become the property of the District upon Completion of the Work performed and shall be delivered to the District prior to final payment. The District's "Drafting Standards and Specifications," if applicable, are provided in SECTION D, SUPPLEMENTAL CONDITIONS or elsewhere in these Contract Documents. Contractor shall comply with the referenced standards and specifications.

5.6. COPYRIGHT

No reports, maps, specifications or other documents produced in whole or in part under this Contract shall be the subject of an application for copyright by or on behalf of the Contractor, or shall be deemed to be copyrighted by virtue of preparation by an engineer or architect or by virtue of any placement of a professional stamp on such reports, maps, specifications or other documents, including but not limited to engineers' and architects' stamps. Any result or materials suitable for copyright arising out of this Contract shall be owned and retained by the District. The District in its sole discretion shall determine whether it is in the public's interest to release or make available any patent or copyright.

5.7. CONTRACT DRAWINGS AND INSTRUCTIONS

5.7.1. The District has prepared designs and sufficient Contract Drawings and Specifications. The Engineer may issue clarifying information during the term of the Contract by means of an Engineer's Instruction, Drawing, and/or an Inspection and Acceptance Test Plan with Witness Points and Hold Points that add detail to the Contract Documents and facilitate the successful testing and Completion of the Contract Work. The Contractor shall be required to provide 48-hour notice to the District for Witness Points and Hold Points as provided in the Inspection and Acceptance Test Plan or otherwise provided by the Project Engineer during performance of the Work. All such Engineer's Instructions, Contract Drawings, Inspection and Acceptance Test Plan and other clarifying information shall be consistent with the Contract Documents and shall be developments thereof and reasonably inferable therefrom.

5.7.2. All Work shall be furnished in strict conformity with the Contract Documents and to the exact dimensions fixed thereby. The District reserves the right to make reasonable changes in dimensions and relocations of materials and equipment, provided that such changes or relocations are made prior to work on any item to be changed or relocated. Such changes or relocations shall be made at no additional cost to the District.

5.8. CONTRACTOR'S COPIES OF DRAWINGS AND SPECIFICATIONS

One (1) complete set of Contract Documents will be provided to the Contractor. The Contractor, upon request to the District, will be supplied with up to two (2) additional sets of Contract Documents, including full size Contract Drawings. One (1) set of Contract Documents shall be kept at the Project site in good condition and at all times available to the District. Additional copies of Specifications and either full or reduced size Contract Drawings, if desired by the Contractor, will be furnished by the District at the Contractor's cost for reproduction, handling and mailing.

5.9. REFERENCED STANDARDS & SPECIFICATIONS

5.9.1. Any Work on this Project not specified in the Contract Specifications shall be performed according to the manufacturer's recommendations and, where applicable, the current "State of Washington Standard Specifications for Road, Bridge and Municipal Construction" prepared by the Washington State Department of Transportation (WSDOT) and Washington State Chapter of the American Public Works Association. The detailed Specifications herein contained shall supersede any provisions of the Washington Standard Specifications in conflict herewith and any manufacturer's recommendations.

5.9.2. UL Label: Where applicable, all materials and equipment for which Underwriters Laboratories, Inc. standards have been established, and their label service available, shall bear the appropriate UL Label.

5.9.3. Reference in the Specifications to codes, standards and specifications promulgated by local, state, and/or federal authorities, professional or technical associations, institutes or societies, are intended to mean the latest edition of each such code, standard or specification adopted and published as of the date of the Contract for this Project, except where otherwise specifically indicated. Each such code, standard or specification referred to shall be considered a part of the Specifications to the same extent as if reproduced therein in full. The following is a representative, though partial, list of such organizations together with the abbreviation by which each is identified:

- ACI American Concrete Institute
- AIA American Institute of Architects
- AISC American Institute of Steel Construction
- ANSI American National Standards Institute
- ASA American Standards Association
- ASHRAE American Society of Heating, Refrigerating and Air Conditioning Engineers
- ASME American Society of Mechanical Engineers
- ASTM American Society of Testing and Materials

- AWSC American Welding Society Code
- AWWA American Water Works Association
- CSI Construction Specifications Institute
- IBC International Building Code
- IEEE Institute of Electrical and Electronics Engineers
- NBS National Bureau of Standards
- NEC National Electrical Code
- NEMA National Electrical Manufacturers Association
- NESC National Electric Safety Code
- NFPA National Fire Protection Association
- UBC Uniform Building Code, 1979 Edition
- UL Underwriters Laboratories, Inc.
- UMC Uniform Mechanical Code
- UPC Uniform Plumbing Code

5.10. MATERIALS AND EQUIPMENT FURNISHED BY DISTRICT

5.10.1. Materials or equipment specified in the Supplemental Conditions and/or the Specifications to be furnished by the District shall be conclusively deemed acceptable for the purpose designed if received in good condition. The Contractor may continue to use such materials or equipment until otherwise directed, however, if the Contractor discovers any defect in materials or equipment furnished by the District, the Contractor shall immediately inform the District of the same in writing and shall cease to use such defective items pending receipt of written instructions from the District.

5.10.2. Materials or equipment specified in the Supplemental Conditions and/or the Specifications to be furnished by the District shall be received by the Contractor F.O.B. the point of delivery specified, and in the absence of such Specification, receipt by the Contractor shall be F.O.B. the facilities of the supplier of the materials or equipment to be so furnished. The Contractor shall receive, load and unload, transport, store and properly protect from damage or loss all such material or equipment and the Contractor shall be responsible for loss or damage after receipt of material or equipment. The Contractor shall immediately report to the District in writing in a form and manner prescribed by the District the receipt of District-furnished material.

5.11. WORKMANSHIP OF CONTRACTOR

All Work shall be such that its several component parts function as a workable system, with all accessories necessary for its proper operation, and the Work shall be completed with all components tested, properly adjusted, and in working order. The Work shall be performed in conformity with the best accepted standard practice of the trade so as to contribute to maximum efficiency of operation, accessibility and appearance and minimum cost of operation, maintenance and future alterations and additions. All Work

shall also be so performed such that the completed Work will conform and adjust to the existing facilities.

5.12. COMPLIANCE WITH SPECIFICATIONS

5.12.1. Unless otherwise specified, all workmanship, equipment or material incorporated in the Work shall be of the best available grades of their respective kinds. Whenever material or an article or piece of equipment is identified on the Contract Drawings or in the Specifications by reference to manufacturers' or vendors' names, trade names, catalog numbers, etc., it is intended merely to establish a standard as to physical size, strength, function, performance, technical data, information, tests, ratings, etc. established by the manufacturer, and herein used by the Engineer in the design of this Project and indicates the minimum acceptable standard and is to be considered "Or Equal" unless otherwise specified.

5.12.2. Offers of substitution for items described in the Contract Documents as "Or Equal" will be considered only upon the written request of the Contractor, and no requests for substitutions will be acknowledged or considered from suppliers, distributors, manufacturers, or Subcontractors or any other source. Requests for approval of substitution shall be made by submitting documentary evidence of equality in the form of, but not limited to, descriptive literature, samples, records of performance, certified copies of tests by independent recognized laboratories, and differences in price and delivery, if any, in the form of certified quotations from suppliers of both the specified material, equipment, method of construction or process, or shop drawings, and the proposed substitute. Contractor shall submit three (3) sets of all data to the Engineer. **NO PURCHASE SHALL BE MADE OR INSTALLATION PERFORMED BY CONTRACTOR WITHOUT THE ENGINEER'S PRIOR WRITTEN APPROVAL.**

5.12.3. If the Contractor is unable to secure all materials or equipment of the size, kind and type specified in these Contract Documents or those proposed as substitutes by the Contractor and accepted by the District as equal in every material respect to those specified, through no fault of its own, the Contractor shall immediately give written notice to the Engineer of the same. Thereafter, the District, at its option, may require the use of substitute materials or equipment of greater or lesser cost, and in such event, the unit price shall be adjusted for the difference in the price between the materials or equipment specified or previously accepted as substitutes equal in every material respect and the substitute materials or equipment accepted. The District at its sole discretion may refuse to accept any substitute material or equipment.

5.12.4. The Engineer shall have the final approval on whether a proposed substitution is approved as an "Or Equal."

5.13. STORAGE OF MATERIALS AND EQUIPMENT

Materials and equipment shall be stored by the Contractor so as to insure the preservation of their quality and fitness for installation and use. When requested by the Engineer, the materials and equipment shall be placed on wooden platforms or other hard, clean surfaces, and not on the ground, and shall be placed under cover and heated adequately to prevent condensation or freezing. Stored materials and equipment shall be located so as to facilitate inspection. The Contractor shall be responsible for all damages to stored and installed materials and equipment that occur for any reason until Completion and final acceptance by the District. After final acceptance, the Contractor's responsibility shall be governed by the warranty provisions of SECTION C, GENERAL CONDITIONS or as specified elsewhere in these Contract Documents.

5.14. INSPECTION, ACCESS AND REJECTED WORK

5.14.1. The District, the Engineer, and their duly authorized representatives and other District employees shall at all times and for any purpose have access to the Project and the premises used by the Contractor, and the Contractor shall provide safe and proper access therefor. Furthermore, the Contractor shall arrange for the District, the Engineer and their duly authorized representatives, at all times, to have immediate access to all places of manufacture where materials are being manufactured, produced or fabricated for use under these Contract Documents, and the Contractor shall provide full facilities for determining whether all such machinery or materials are being made strictly in accordance with the Specifications and Contract Drawings. The Contractor shall, whenever so requested, give the Engineer access to the invoices, bills of lading, etc., and shall provide scales and assistance for weighing and/or measuring any of the materials or equipment.

5.14.2. Except as otherwise provided in the Contract Documents, all materials and Work shall be subject to inspection, examination and testing by the Engineer at any and all times during the Work. The Engineer will have the right to reject defective material and Work. Rejected Work shall be satisfactorily replaced with proper material, or reaccomplished if the material need not be replaced, and the Contractor shall remove rejected materials from the premises. If the Contractor fails to proceed at once with the replacement of rejected materials or the correction of defective Work, the District may, by contract or otherwise, replace such material or correct such Work and charge the cost thereof to the Contractor.

5.14.3. The Contractor shall provide without additional charge all facilities, labor and materials necessary for any inspections. Tests will be carried out in such manner that the Work will not be delayed. Access to and around the immediate Work site shall be continuously maintained so that inspections may be made at any time by the Engineer or any Inspector.

5.14.4. In the event it is considered necessary or advisable by the District at any time before final acceptance of the entire Work to make an examination of the Work which is partially or fully completed by disassembling, removing, tearing out and satisfactorily reassembling or reconstructing any portion thereof, upon written notice from the District the Contractor shall promptly furnish all necessary facilities, labor and materials for such examination. If such Work is found to be defective in any material respect, or if it is found that such Work is not in conformity with the Contract Documents, the Contractor shall pay all the costs of such examination. If, however, such Work is found to meet the requirements of the Contract Documents, or is defective through no fault of the Contractor or its Subcontractors, additional costs in accordance with SECTION C, GENERAL CONDITIONS, PROGRESS AND COMPLETION, CHANGES IN THE WORK/FIELD WORK ORDER/CHANGE ORDERS, "Changes in Work" shall be paid to the Contractor as full compensation for Work connected with such examination and the Contract Time shall be increased by the number of days required for disassembling and reconstructing.

5.14.5. The Contractor is not relieved of any obligations to fulfill the Contract as prescribed, and defective Work shall be corrected and unsuitable materials shall be rejected by the District and replaced by the Contractor, notwithstanding that the defective work and materials have been previously inspected by the Engineer or an Inspector.

5.15. STOP WORK DIRECTIVE

Where, in the judgment of the Engineer, the Contractor or any Subcontractor is performing Work contrary to the conditions and terms of the Contract, where continued operations could cause damage, preclude further inspection, or render remedial action ineffective for any product or services provided by the Contractor or Subcontractor, the Engineer will notify the Contractor of any such situation in writing.

If, after this notification by the Engineer, the Contractor does not commence appropriate corrective action to the satisfaction of the Engineer, the Engineer may issue a Stop Work Directive (SWD) stating the specific work to be discontinued and so notify the Contractor in writing.

If the District becomes aware of any potential WISHA or OSHA violation on the Project, the District may immediately issue to the Contractor a notice of a safety violation. The Contractor's Superintendent shall be required to sign all notices issued. The Contractor shall immediately perform necessary corrective measures so it is in compliance with WISHA and OSHA regulations. If the Contractor refuses to take corrective action or receives repeated violations, the District may issue a SWD. Nothing in this section shall relieve Contractor of the primary responsibility for the safety of the Work site.

Upon receipt of a SWD from the Engineer, the Contractor and the Subcontractor shall cease operations, including shipments, on any specified product or services to the extent mandated by the SWD. Work shall not resume until the Contractor has obtained a written authorization from the Engineer. A written authorization to resume further operations shall be granted only upon approval of the Contractor's written commitment to correct those conditions itemized on the SWD.

The issuance of a SWD shall constitute a non-excusable delay, and the Contractor shall not be entitled to time extension or additional compensation (either direct or consequential) due to the delay.

6. LEGAL

6.1. WARRANTY

6.1.1. The Contractor warrants to the District that the Work shall perform and operate for the purpose(s) specified, shall be new and free from defects and deficiencies in material and workmanship, shall meet all Specifications, including those relating to performance contained or incorporated by reference in the Contract and that any assembly and/or installation will be performed in a competent manner in accordance with accepted industry standards.

6.1.2. The foregoing warranties shall apply to defects or deficiencies occurring within a period of one (1) year from the date of final acceptance of the Project by the District.

6.1.3. If, during the warranty period, the Work is not available for normal use due to a failure to comply with the requirements of the Contract Documents or any warranty, the time of unavailability shall not be counted as part of the warranty period. If at any time during the warranty period the District notifies the Contractor of any failure to comply with the warranty, the Contractor shall promptly and, at the time the District directs, correct any noncompliance and remedy any damage to other items of the Work or any other property resulting from the noncompliance. The warranty period shall then be extended for any corrected Work until the expiration of an additional warranty period, that shall commence upon the acceptance by the District of the correction or the expiration of the original warranty period, whichever is later. In no event shall the warranty for an item of corrected Work extend for more than three (3) warranty periods as defined herein. All costs involved in correcting and remedying any noncompliance (including, but not limited to, the removal, replacement and reinstallation of items necessary to gain access, including all labor costs), shall be borne by the Contractor.

6.1.4. If the Work does not meet the warranties specified above, the Contractor, after receipt of written notice from the District, shall immediately correct any defect or deficiency, including nonconformance with the Specifications. The cost of

labor, materials and equipment associated with such repair or replacement of the Work shall be borne by the Contractor.

If unit outages will be necessitated as a result of such repair or replacement, Contractor agrees to perform the Work in a manner that would be most cost effective to the District. This decision will be at the sole discretion of the District. Contractor recognizes that performance of the repair or replacement may necessitate swing and graveyard shifts, working weekends, and acceleration of the Completion date for the overall Project, and agrees to perform same with sufficient personnel as required by the District. All cost of labor for overtime labor, materials and equipment associated with such repair or replacement during special shift work shall be borne by the Contractor.

6.1.5. In the event the Contractor fails to remedy any such defect or deficiency in a timely manner, the District may undertake such remedy as it deems reasonably necessary and the Contractor shall bear all costs reasonably associated with said remedial action by the District. The reasonable time for repairs/remedies shall be determined by the District.

6.1.6. The Contractor shall obtain written warranties from Subcontractors and suppliers of materials and equipment and shall deliver the original warranties to the District prior to final acceptance of the Project. Such warranties shall state that they run in favor of the District, regardless of whether contract privity exists between the warrantor and the District.

6.1.7. Neither the final payment, nor any other provision of the Contract, nor partial or entire use of the materials and/or equipment by the District shall relieve the Contractor of liability with respect to the warranties referred to in the Contract or any other warranties express or implied.

6.1.8. The warranty provided herein is in addition to, and not in lieu of, any other guarantees, warranties, rights or remedies that may otherwise be available under applicable law to the District, and shall not in any way limit the same. **IMPORTANT:** Warranty terms may be stated in SECTION D SUPPLEMENTAL CONDITIONS, or SECTION G, SPECIFICATIONS, which may amend or replace some or all of the terms of this Warranty section.

6.2. INDEMNITY

6.2.1. The Contractor covenants and agrees that it will indemnify and hold harmless the District and any and all of the District's officers, principals, agents and employees, from any liability, loss, damage, cost, charge or expense, whether direct or indirect, arising in any way out of the performance of this Contract (including, but not limited to contractual claims, lien claims, retainage claims, extra work claims, bodily injury and property damage) to which the District or said other indemnities may be put or subject by reason of any act, action, neglect, omission or default under this Contract

on the part of the Contractor or any Subcontractor or any of the Contractor's or Subcontractor's officers, principals, agents, or employees. The indemnity provision shall be specifically subject to RCW 4.24.115 (or as amended). Contractor's indemnity obligations shall survive the Completion and final acceptance of the Contract, and shall only terminate upon final satisfaction by the Contractor of all such suits, claims or other proceedings.

6.2.2. In the event any suit, claim or other proceeding shall be brought against the District or any of the District's officers, principals, agents or employees, at any time alleging facts that, if proven, would give rise to the indemnity obligation set forth in paragraph 6.2.1 above, the Contractor hereby covenants and agrees to assume the defense thereof and defend the same at the Contractor's own expense. Within the limits of paragraph 6.2.1 above, the Contractor agrees to pay all judgments that may be incurred by or obtained against the District or any other indemnitee under this section as a result of such suits, claims or other proceedings.

6.2.3. The Contractor's submission of a bid under these Contract Documents and execution of the Contract constitutes Contractor's conscious and intentional acceptance of the terms of this section and the Contractor's express waiver of any and all statutory immunity provided by the Washington State Industrial Insurance Act, RCW Title 51, with regard to all rights of the indemnitees stated herein. **THE TERMS OF THIS SECTION, SPECIFICALLY INCLUDING THE PRECEDING WAIVER OF IMMUNITY, SHALL BE DEEMED MUTUALLY NEGOTIATED TO THE FULLEST EXTENT ALLOWED BY THE LAWS OF WASHINGTON APPLICABLE TO THE DISTRICT CONCERNING BIDDING AND AWARD OF CONTRACTS FOR PUBLIC WORKS.**

6.3. SUBCONTRACTS

6.3.1. The Contractor shall be and operate as an independent contractor in the performance of the Work and shall have complete control over and responsibility for all personnel and all tiers of Subcontractors performing the Work. In no event shall the Contractor be authorized to enter into any agreements or undertakings for or on behalf of the District or to act as or be an agent or employee of the District.

6.3.2. The Contractor agrees that it is fully responsible to the District for the acts and omissions of its Subcontractors and of persons and/or entities either directly or indirectly employed by them as it is for the acts and omissions of persons employed by it directly. Contractor shall not utilize any Subcontractor or supplier to whom the District has a reasonable objection and District has notified the Contractor of same, and shall obtain the District's written consent before making any substitutions or additions to its list of Subcontractors.

6.3.3. If the District concludes that any portion of the Work subcontracted by the Contractor is not being prosecuted in accordance with the Contract Documents,

the Contractor shall, upon request of the District, remove the Subcontractor performing such Work. Such removal shall not relieve the Contractor of its responsibility for the performance of the Work or complying with all other requirements of the Contract.

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

6.3.5. Contractor shall require and set forth in its written contracts with Subcontractors that all Subcontractors are and shall be bound by the terms of the Contractor's Contract with the District, including, but not limited to the General and Supplemental Conditions, Specifications, Contract Drawings, Addenda, Field Work Order/Change Orders (which will be incorporated into the subcontract by reference), and shall assume toward Contractor the obligations and responsibilities that the Contractor assumes in and by the aforesaid documents towards the District.

6.4. TRADE JURISDICTION AND APPRENTICE WORKERS

6.4.1. The Contractor shall maintain, and require the first-tier Subcontractors to maintain, complete and current information on trade jurisdiction matters, regulations, actions and pending actions, as applicable to the performance of the Work, and this information shall be discussed at appropriate Project meetings at the earliest feasible dates. Information of particular relevance presented at such meetings shall be recorded along with actions agreed upon. The manner in which the Contract Documents have been organized and subdivided is not intended to be an indication of jurisdictional or trade union agreements or an exact division of responsibilities associated with a specialty Contractor or Subcontractor. The Contractor shall assign and subcontract the work, and employ tradesmen and labor, in a manner which will not unduly risk jurisdiction disputes of the kinds which could result in conflicts, delays, claims, and losses in the performance of the Work.

6.4.2. The Contractor certifies that it will use its best efforts to utilize apprentice workers, when available in the geographic area, on this Project, provided this can reasonably be done without compromising project safety and project quality. Contractor shall submit on its Certificate and Release (see SECTION E, CONTRACT DOCUMENT FORMS) the total hours for each craft worked on the Project and total apprentice hours for each craft worked on the Project.

6.5. CONTRACTOR'S DEFAULT

6.5.1. Any of the following events constitute an act of default by the Contractor and a material breach of the Contract:

- The Contractor abandons the Work.
- The Contractor fails to supply workers with relevant experience and sufficient skills, suitable materials or suitable equipment or performs Work of a lesser quality than specified in the Contract Documents.
- The Contractor fails to fully maintain the schedule of Work or fails to fully meet any of the schedules or Project milestone dates specified in the Contract Documents.
- The Contractor violates laws, regulations or orders of any public body having jurisdiction, or does not comply with instructions or directives from the Engineer, or disregards the authority of the Project Engineer.
- The Contractor fails to make prompt payment for labor, materials, supplies, equipment or to Subcontractors.
- The Contractor fails to provide the approved Statement of Intent to Pay Prevailing Wages or fails to provide and maintain in effect the insurance required by the Contract Documents.
- The Contractor fails to comply with the conditions, Specifications or provisions of the Contract Documents.
- The Contractor is careless or incompetent as determined by the District.
- The Contractor ceases or is unable to pay its debts as they mature, or authorizes or takes any action under bankruptcy or reorganization, readjustment of debt, insolvency, liquidation or other similar laws, or proceedings under any such laws are instituted against it.
- The Contractor assigns the Contract or sublets Work without first obtaining the District's permission.
- The Contractor receives a Stop Work Directive and fails to take corrective action.
- The Contractor receives multiple Stop Work Directives.
- The Contractor fails to pay attorneys fees and costs as provided in SECTION C, GENERAL CONDITIONS, LEGAL, APPLICABLE LAW/COURT COSTS/ ATTORNEYS FEES.
- The Contractor is otherwise in violation of any material provision of the Contract.

6.5.2. If the Contractor fails to remedy any of the above acts of default within five (5) days after the District delivers to it written notice of the default, the District may, without limiting any other remedy available to it, withhold any amounts otherwise due under the Contract and/or terminate the Contractor's right to proceed with all or any portion of the Work. The District shall also have the right, but shall not be obligated, to complete the Work by whatever method the District deems expedient, including employing another contractor(s) under any contract(s) the District deems advisable. The District may provide any labor or materials and perform all or any part of the Work which has been terminated. To complete the Work, the District shall have the right to take possession of materials and supplies and to use any or all of the materials, supplies, tools, equipment, and property furnished by the Contractor for the Work. The Contractor shall not remove any materials, tools, equipment or supplies from their location at the time of termination without the prior written consent of the District.

6.5.3. The expense of completing the Work, together with a reasonable charge for awarding and administering any contract(s), and the damages caused by the delays in completing the Work will be charged to the Contractor. The District will deduct the amounts described in the preceding sentence from any amounts which may be due or may become due to the Contractor. In case the expenses exceed the amounts due or to become due, the Contractor shall, upon notice from the District, promptly pay to the District the amount of the excess. The District shall not be required to obtain the lowest figures for Contract Completion, but may make those expenditures which in its sole discretion will best accomplish timely, quality Completion.

6.5.4. The District's termination of a Contractor shall not affect any rights of the District against the Contractor then existing or which may thereafter accrue. Any retention or payment of moneys by the District due to the Contractor shall not release the Contractor from liability.

6.6. CONTRACTOR'S CLAIMS

6.6.1. If at any time the Contractor claims that the District may, for any reason, owe it damages, additional payment, or a time extension, the Contractor must file a written claim with the District in strict compliance with this section. The written claim shall set out a detailed, factual statement of the claim for additional compensation or for additional time: (1) listing the date on which facts arose that gave rise to the claim; (2) identifying any documents and/or oral statements that support the claim; (3) listing for time extensions claimed the specific dates for which the extension is sought and the reasons Contractor claims a time extension should be granted for the dates identified, and (4) listing for additional compensation sought a breakdown of labor, materials, equipment, overhead and any other amounts claimed. Contractor must deliver to the District a written notice that fully complies with the above requirements within no later than ten (10) days after the event giving rise to the claim occurred and before proceeding with any Work upon which the claim is based. Failure to provide the written

notification in strict compliance with the above requirements (including but not limited to contents of notice and time of notice) shall constitute an absolute waiver of any such claim. No act, admission or knowledge, actual or constructive, of the District or the Engineer or any District employee shall in any way constitute a waiver of the above requirements, unless the District provides the Contractor with an express, unequivocal written waiver of the specific requirement being waived.

6.6.2. Within a reasonable time after presentation of a claim, the District shall give the Contractor written notice of the District's decision on any claim of the Contractor. All such decisions of the District shall be final.

6.6.3. Pending final resolution of a claim, unless otherwise agreed in writing, the Contractor shall proceed diligently with performance of the Contract.

6.7. NOTICES

The District may deliver, send via Electronic Transmission or mail to the Contractor at the address given by the Contractor in its bid any written notice which the Contract Documents provide that the District shall give to the Contractor. Written notice delivered to the Contractor's Superintendent at the job site shall constitute notice to the Contractor. The Contractor may deliver, fax to the District's fax number, or mail to the District any notice which the Contract Documents provide that the Contractor shall give to the District. Written notice delivered to the District's Engineer at the job site shall constitute notice to the District.

6.8. TERMINATION FOR CONVENIENCE

6.8.1. The District may terminate the Contractor's right to proceed with all or any portion of the Work upon ten (10) days written notice to the Contractor. Upon receipt of any notice of termination, the Contractor shall immediately stop all work being performed unless the notice of termination expressly directs otherwise.

6.8.2. Upon receipt of any such notice, the Contractor shall, unless the notice states otherwise:

6.8.2.1. stop the Work on the date and to the extent specified in the notice of termination;

6.8.2.2. place no further orders or subcontracts for services, equipment or materials relating to the terminated portion of the Work;

6.8.2.3. terminate all orders and subcontracts to the extent that they relate to the performance of Work terminated by the notice of termination as directed by the District;

6.8.2.4. if requested by the District, assign to the District, in the manner and to the extent directed by it, all of the rights, title and interest of Contractor under the orders or subcontracts so terminated, in which case District shall have the right, if it elects to do so, to settle or pay any or all claims relating to the termination of such orders and subcontracts;

6.8.2.5. if requested by the District, settle all outstanding liabilities and all claims arising out of the termination of orders and subcontracts, in a Satisfactory manner;

6.8.2.6. deliver to the District, when and as directed by the District, all documents and all property and transfer title to such property to the District to the extent not already transferred; and

6.8.2.7. to the extent requested by the District, assist the District in maintaining, protecting, and/or disposing of Work in progress, plant, tools, equipment and materials acquired or utilized by Contractor relating to the Work.

6.8.3. In the event of such termination, Contractor waives any claim for damages, including but not limited to, any claims for loss of anticipated profits, and agrees to accept in full settlement of all claims by Contractor and any Subcontractors or suppliers such proportion of the Contract Price due to Contractor under this Contract as the Work actually completed bears to the entire Work to be performed by Contractor under this Contract, as determined by the District, less any payments already made to Contractor and less any amounts withheld by the District to settle claims against or to pay indebtedness of Contractor in accordance with the provisions of this Contract. In the event of such termination, Contractor shall be entitled to no payment beyond that specified in this paragraph and Contractor shall defend, indemnify and hold the District harmless of all claims for amounts other than the above, including but not limited to, all claims for lost profit, loss of business expectancy, and the like.

6.9. ASSIGNMENT OF CONTRACT

6.9.1. The Contractor agrees that it will not sell, assign, transfer or sublet this Contract or any part thereof or interest therein, either by power of attorney or otherwise, without the prior written consent of the District, and that any such sale, assignment, transfer or subletting, without such consent of the District, shall be null and void.

6.9.2. The Contractor shall not assign any monies due or to become due it under the Contract without the prior written consent of the District. No assignment of the rights given to the Contractor under the terms of the Contract Documents shall be valid unless it contains a provision that the funds to be paid to the assignee under the assignment are subject to all of the Contractor's obligations under the Contract, i.e. that the Contractor delegates its duties under the Contract and the assignee agrees to fully

perform those duties. The District shall have the absolute right to reject the assignment to the proposed assignee. Any assignment made without the District's written consent shall be null and void. The original Contractor shall remain liable for performing under the Contract to the extent the assignee does not perform or the assignee's Work is rejected by the District.

6.10. PATENTS AND ROYALTIES

6.10.1. The Contractor shall pay the costs of all royalties, permits, taxes, licenses or other fees necessary for the performance of this Contract.

6.10.2. When notified and authorized in writing by the District, the Contractor shall defend, at the Contractor's expense, any suit or proceeding brought against the District so far as such suit or proceeding is based on a claim that the manufacture, sale or use of materials or equipment furnished by the Contractor as part of the Work under the Contract constitutes an infringement of any patent, and the Contractor shall pay all damages and costs awarded against the District, and shall otherwise hold the District harmless; provided that the Contractor's obligation shall not extend to a claim of infringement based upon the manufacture, sale or use of materials or equipment furnished by the Contractor in combination with materials or equipment not furnished under the Contract. If the Contractor refuses to defend such suit or if, in the opinion of the District, the Contractor does not tender an adequate defense to the claims made in such suit, the District may seek counsel to protect the District's interests. The Contractor shall be liable for the costs and attorneys fees associated with the District's actions in this regard.

6.10.3. In the event the manufacture, sale or use of materials or equipment is held to constitute infringement and the use of part or all of the Work is enjoined, the Contractor, at its expense, shall either obtain for the District the unqualified right to continue using said material or equipment for an indefinite period or shall replace the same with non-infringing material, or shall remove said material or equipment and refund to the District the purchase price and the transportation and installation costs thereof.

6.11. PERMITS

Permits, licenses and easements of a temporary nature which are necessary only for and during the prosecution of the Work shall be secured and paid for by the Contractor, except those permits, licenses or easements of a temporary nature which are described in SECTION D, SUPPLEMENTAL CONDITIONS or SECTION G, SPECIFICATIONS.

6.12. LIABILITIES OF THE CONTRACTOR

In addition to other legal obligations under these Contract Documents, the Contractor accepts the following legal responsibilities:

6.12.1. The Contractor shall comply with the laws and regulations of the United States and of the State of Washington and all local ordinances and regulations, and shall be responsible for a strict observance by its employees and all Subcontractors of said laws, ordinances and regulations.

6.12.2. The Contractor shall have the sole responsibility for furnishing the District with completed divisions of Work until said divisions are accepted in writing by the District. Materials or Work damaged, lost, stolen or destroyed prior to said acceptance by reason of any cause whatsoever, whether within or beyond the control of the Contractor, shall be repaired or replaced in their entirety by the Contractor solely at its own expense.

6.12.3. The Contractor shall perform the Work with due regard for adequate safety and sanitary measures and shall maintain its facilities and equipment in a safe condition. Contractor shall conform to current safety engineering practices and comply with all applicable federal, state and local regulations. Equipment shall be inspected and members of crews licensed by the proper authorities where required. Reports of all lost time accidents shall promptly be submitted to the Engineer in writing, giving such information as may be required by Engineer.

6.12.4. The Contractor shall be responsible for the preservation of all property in the vicinity of or upon the site of the Work and shall use every precaution necessary to prevent damage thereto. In the event the Contractor damages any property, it shall at once notify the District Engineer and make or arrange to make full restitution. Should the Contractor injure any person or property, it shall at once make or arrange to make full settlement at its own expense. The Contractor shall report immediately, in writing, to the Engineer all pertinent facts relating to such property damage, bodily injury or personal injury. A written report detailing the ultimate disposition of the claim for injury or damage will be required by the Engineer.

6.12.5. The Contractor shall use all necessary precautions to avoid the destruction of surveying markers, including but not limited to, section corners, witness trees, property corners, mining claim markers, bench marks, triangulation stations, etc. If any such markers must be destroyed, the Contractor shall first notify the agency responsible for the marker as well as the Engineer. All costs of replacing markers will be borne by the Contractor.

6.12.6. The Contractor shall construct and maintain at its own expense such temporary barricades, fences, gates and other facilities as shall be necessary for preservation of crops, confinement of livestock and protection of persons and property. Before cutting a fence, the Contractor shall take necessary precautions to prevent the straying of livestock and shall prevent the loss of tension in or damage to adjacent portions of the fence. The Contractor shall immediately replace at its own expense all fences and gates that are cut, removed, damaged, or destroyed in the course of

performance of the Work with new materials to the original standard, with the exception that undamaged gates may be reused. Makeshift repairs to fences and gates will not be acceptable.

6.13. APPLICABLE LAW/COURT COSTS/ATTORNEYS FEES

6.13.1. All Contract Documents shall be construed, for all purposes, solely and exclusively in accordance with and pursuant to the laws of the State of Washington. The rights and obligations of Bidders, the District, and the Contractor shall be governed by the laws of the State of Washington. Contractor submits to the exclusive jurisdiction of the State Courts in Washington, and venue for any action filed to enforce or interpret the provisions of this Contract, or any other legal action, shall be in the Superior Court of the County of Chelan, State of Washington, USA.

6.13.2. Subject to SECTION C, GENERAL CONDITIONS, PAYMENT, TIME AND MANNER OF PAYMENT TO CONTRACTOR and PAYMENTS BY CONTRACTOR, the Contractor may bring no litigation on claims unless such claims have been properly raised and considered in the procedures of SECTION C, GENERAL CONDITIONS, LEGAL, CONTRACTOR'S CLAIMS, above. All claims properly raised shall be resolved by initiation of an action in the Superior Court of Chelan County, Washington.

6.13.3. All Work performed pursuant to this Contract shall be in compliance with statutory and regulatory provisions of the State of Washington relating to public works including, but not limited to, the following as the same may be applicable.

- Chapter 39.04 RCW relating to pollution and preservation of natural resources.
- Chapter 39.06 relating to registration and licensing of Contractors on public works.
- Chapter 18.27 RCW relating to registration of contractors.
- Chapter 39.08 RCW relating to contractor's bond.
- Chapter 39.12 RCW relating to prevailing wages on public works.
- Chapter 39.25 RCW relating to offshore items.
- Chapter 49.28 RCW relating to hours of labor.
- Chapter 49.60 RCW relating to law against discrimination.
- Chapter 54.04 RCW relating to contracts by Public Utility Districts.
- Chapter 60.28 RCW relating to withholding of retainage.
- Chapter 70.92 RCW relating to provisions for the aged and physically handicapped.

6.13.4. Each and every provision of law and clause required by law to be inserted in this Contract shall be deemed to be inserted herein and the Contract shall be read and enforced as though it were included herein.

6.13.5. In the event it is necessary for either party to utilize the services of an attorney to enforce any of the terms of the Contract, such enforcing party shall be entitled to compensation for its reasonable attorneys fees and costs whether or not legal action is initiated and regardless of whether the dispute is settled by trial, trial and appeal, arbitration, mediation, negotiation or otherwise and regardless of whether suit is formally filed. Failure to pay the costs and attorneys fees provided for herein shall constitute an event of default under this Contract.

6.14. COMPLIANCE WITH LAWS

Contractor shall comply with all applicable laws, ordinances, and codes of federal, state and local governments.

7. INSURANCE

7.1. MINIMUM INSURANCE REQUIREMENTS

7.1.1. Liability Insurance. The Contractor shall, at its own expense, carry and maintain Commercial General Liability Insurance or equivalent Comprehensive General Liability Insurance with endorsement for Broad Form Contractual Liability Insurance, and Completed Operations Insurance throughout the course of performance of the Work and for at least one (1) year following Completion and final acceptance of the Work. Such liability insurance shall indemnify the Contractor and its Subcontractors against loss from liability imposed by law upon, or assumed under Contract by, the Contractor or its Subcontractors for damages on account of such public liability, contractual liability, property damage, products liability or completed operations liability. SAID INSURANCE SHALL PROVIDE "OCCURRENCE" COVERAGE, NOT "CLAIMS MADE" COVERAGE.

Said liability insurance shall have a combined single limit for bodily injury, including personal injury and death, and property damage of at least \$2,000,000 per occurrence; or, alternatively, split limits of \$1,000,000 per occurrence for bodily injury, including personal injury and death, and \$1,000,000 per occurrence for property damage. If a general aggregate limit is applicable to the Contractor's policy, it shall not be less than \$2,000,000.

7.1.2. Automobile Insurance. The Contractor shall, at its own expense, carry and maintain automobile liability insurance covering any auto, truck or other motor vehicle used by the Contractor in connection with the Work. Such coverage shall have a combined single limit per occurrence for bodily injury and property damage of not less than \$1,000,000.

7.1.3. Property Insurance. The Contractor shall, at its own expense, carry and maintain "All Risk" form of "Builder's Risk", installation floater, or equivalent property insurance insuring the District, Contractor and all Subcontractors from and

against all risks of physical loss or damage to the Project (including permanent and temporary buildings and contents), materials, equipment and supplies for the full replacement value of the Project and its several components, while in transit to the job site, while there awaiting installation, during installation and all forms of testing, and until Completion and final acceptance by the District of Contractor's Work hereunder. Upon written request by the Contractor to the District, the District may, at its sole discretion, accept Subcontractor's property insurance in substitution for Contractor's property insurance, in whole or in part, to cover the District's, Contractor's, and Subcontractor's interest in the Project. The District's acceptance of Subcontractor's property insurance does not relieve the Contractor from the ultimate responsibility to comply with and maintain insurance coverage in accordance with the provisions of this Property Insurance section. The District shall be named as loss payee as respects this coverage for the Project.

7.2. ADDITIONAL INSURANCE CONDITIONS

7.2.1. Additional Insured Status. The District shall be identified as an additional insured on all general liability and employer's liability policies required of the Contractor pursuant to these Contract Documents. The coverage afforded to the District as an insured shall be primary and not excess or contributing to any insurance held by the District or any District self insurance program. The insurance provided shall apply separately to each insured. This separate coverage requirement may be met by a cross liability clause, a severability of interest clause or an acceptable definition of the term "insured".

7.2.2. Deductible. No insurance policy required herein shall have a deductible or self-insured retention of more than \$25,000. In the event the Contractor's insurance program has a deductible in excess of \$25,000, the District reserves the right to waive the aforementioned condition following review and acceptance of Contractor's most current audited financial statement documenting financial security available to cover the deductible amount(s). Payment of deductibles and premiums are the sole responsibility of the Contractor.

7.2.3. Special Provisions. Different or additional insurance requirements may be specified in SECTION D, SUPPLEMENTAL CONDITIONS, of these Contract Documents.

7.2.4. Thirty Day Notice. All insurance policies shall include a provision to the effect that the insurance policy shall not be subject to cancellation, lapse, or to reduction in the required limits of liability or amount of insurance until notice has been mailed to the District by the insuring company stating the date that such cancellation, lapse or reduction shall be effective, which date shall be not less than 30 days after the mailing of such notice. The standard Acord form Certificate of Insurance cancellation clause shall be amended to read as follows: "Should any of the above described

policies be canceled before the expiration date thereof, the issuing company will mail 30 days written notice to the certificate holder named to the left."

7.3. CERTIFICATION AND CANCELLATION OF INSURANCE

7.3.1. No Cancellation. The Contractor shall not cause any insurance policy required under these Contract Documents to be canceled or permit any such policy to lapse unless replaced with no lapse in coverage.

7.3.2. Certificate shall state deductible amounts. Deductible amounts applicable to any insurance specified under these Contract Documents shall be clearly set forth on the Insurance Coverage Checklist, SECTION E, CONTRACT DOCUMENT FORMS.

7.3.3. Ten Day Filing Requirement. Within ten (10) days after receipt of the Notice of Award, the Contractor shall file with the District certificates from its insurance companies certifying to the coverage of all insurance required herein. **IMPORTANT:** Work will not commence on the Project until the Contractor's Insurance Certificate, with required attachments, is received by and is acceptable to the District. The District reserves the right to determine the completeness and adequacy of the Contractor's Insurance Certificate, required attachments and the acceptability of deductible or self-insured retention levels. Renewal certificates are required prior to the expiration of the insurance policies.

Failure to submit a renewal certificate or finalizing correction of minor deficiencies in the insurance documents to maintain compliance with the Contract may result in the withholding of progress payments until the deficiency(ies) is corrected.

7.3.4. Contents of Certificates. All certificates of insurance shall be authenticated by the proper officer of the insurer and shall certify the name of those insured, the type and amount of the insurance, and the expiration date. Contractor shall submit with and as part of its Insurance Certificate a copy of all special or additional exclusions or endorsement riders and the completed Insurance Coverage Checklist from SECTION E, CONTRACT DOCUMENT FORMS, of these Contract Documents. The Contractor's Insurance Certificate and attachments must clearly state the existence of all coverage and compliance with all insurance conditions required by these Contract Documents.

7.3.5. Delivery of Certificate. The completed Insurance Certificate with all necessary attachments shall be delivered to the District's Procurement & Contract Services Department.

7.4. WORKERS COMPENSATION INSURANCE

In addition to such other insurance as may be required under this Contract, the Contractor and its Subcontractors, at their own expense, shall also maintain Workers Compensation Insurance in the amount and type required by law for all employees under this Contract who may come within the protection of workers compensation laws. Contractor hereby expressly waives its rights of subrogation against the District for any workers compensation claims arising out of this Contract. The Contractor and its Subcontractors shall maintain employer's liability insurance (or Stop Gap) in an amount and form and with a company or agency Satisfactory to the District for the benefit of all employees not protected by worker's compensation laws. Evidence of employer's liability insurance (or Stop Gap) shall be included on the Insurance Certificate. It is the Contractor's and its Subcontractor's sole responsibility to purchase and maintain coverage in compliance with the United States Longshoremen & Harborworkers Act (USL&H), Jones Act, or any federal law, state statute, or local ordinance which may be applicable to this Project.

7.5. INSURANCE SHALL NOT LIMIT LIABILITY

The insurance coverage and benefits required herein, or in any other Contract Document, shall not be deemed to limit the Contractor's liability to the District or any third party. In the event the minimum insurance limits specified in this Contract Document are less than the maximum amount of insurance in effect for the Contractor at the time of claim or loss which arises from or is connected to the Work, Contractor affirmatively agrees that all insurance limits available to it will be extended to the District as additional insured.

8. PROGRESS AND COMPLETION

8.1. NOTICE TO PROCEED

Promptly after the execution of and approval by the District of the documents set forth in the Notice of Award, written Notice to Proceed will be given by the District to the Contractor. The Contractor shall not begin any onsite Work before the date specified on the Notice to Proceed, or as directed by the District, and the Work shall be carried on regularly and without interruption thereafter, with such force as to assure the Completion of the Work within the Contract Time stated in the Contract Documents unless otherwise directed in writing by the District or duly constituted authority.

8.2. TIME FOR PERFORMANCE OF WORK

The District considers the Contract Time sufficient to complete all Work. The Contractor agrees to complete the Work to the reasonable satisfaction of the District, free of all claims, liens and charges, within the Contract Time specified in the Contract Documents. The Contractor's schedule for completion shall be based on a five (5) day,

eight (8) hours per day work week. The Contractor shall not work after the hours of 5:00 p.m., before 8:00 a.m., or on Saturdays, Sundays or District holidays without the written consent of the Engineer.

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

8.3. PRECONSTRUCTION CONFERENCE

Within approximately ten (10) days following the issuance of a Notice of Award, a pre-construction conference will be held in the District's Headquarters Building, as mutually agreed upon by the Engineer and Contractor. The Contractor shall be represented at the meeting by the Contractor Superintendent. All aspects of the job will be discussed.

8.4. PROGRESS, ORGANIZATION AND FACILITIES

8.4.1. The Contractor shall employ an ample force of employees and provide properly adapted and maintained construction facilities of sufficient capacity and efficiency to prosecute the Work in a workmanlike manner at the rate of progress necessary for Completion within the Contract Time.

8.4.2. Should the Contractor fail to maintain such rate of progress, the Engineer may require, at no additional expense to the District, additional employees and facilities be placed on the Work or a reorganization of facilities layout be effected in order that the rate of progress necessary for timely completion of the Work can be maintained.

8.5. WORK SCHEDULE

8.5.1. Within ten (10) days following award of the Contract, the Contractor shall furnish the Engineer a written schedule outlining in reasonable detail its proposed sequence of operations. The Contractor shall at no time change its schedule without the approval of the Engineer. The Engineer shall have the right to require changes in the schedule at any time to meet requirements of timely completion of the Work or outage constraints. The Engineer will inform the Contractor in writing as the Work proceeds as to the status of deliveries of materials to be furnished by the District, and as to the status of land right-of-way availability. Approval of the Contractor's schedule shall in no event be construed as relieving the Contractor of any responsibility in connection with its performance of the Work in the Contract Time specified.

8.5.2. Unless stipulated otherwise in the Contract Documents, the schedule shall be in the form approved by the Engineer, indicating the estimated duration and completion dates of all significant trade portions and phases of the Work.

8.6. CHANGES IN THE WORK/FIELD WORK ORDER/CHANGE ORDERS

8.6.1. By proper action of its governing body or authorized designee and without invalidating the Contract, the District, at its discretion, may make any changes, including additions to or deductions from the Project, provided such changes are within the general scope thereof regardless of the size or magnitude of said change. It shall be the responsibility of the Contractor, before proceeding with any change, to satisfy itself that the execution of a Field Work Order/Change Order has been properly authorized on behalf of the District by its governing body or designee.

8.6.2. The Contractor agrees that it shall maintain a superintendent on site as required in Section C, General Conditions, Project Site Management AND Safety, Contractor's Superintendence. Contractor agrees that the superintendent shall have the authority to agree to and execute all Field Work Order/Change Orders on behalf of the Contractor. A Field Work Order/Change Order does not require the signature of the Contractor to be in effect. If the document is presented to the Contractor but not signed by the Contractor, then the requested change shall be carried out by the Contractor and payment will be based on the actual cost method as presented below.

8.6.3. Charges or credits for the Work covered by the change shall be determined by one or more of the following methods, at the District's option:

8.6.3.1. Unit Prices specified in the Unit Price Schedule for Changed Work submitted with the Contractor's Bid Proposal, if any.

8.6.3.2. An agreed lump sum.

8.6.3.3. The actual cost, which is to include:

8.6.3.3.1. Labor, including foreman.

8.6.3.3.2. Materials entering permanently into the Work.

8.6.3.3.3. The ownership or rental cost of the facilities and equipment during the time of use on the Project. The equipment rental rates paid by the District shall not exceed rates as established in the current Rental Rate Blue Book.

8.6.3.3.4. Engineering and transportation costs necessitated by the change.

8.6.3.3.5. The cost of the increased premium for the Performance and Payment Bond required to cover the additional Work.

The Contractor shall be allowed to include a fixed fee of 15% as complete compensation for all profit and overhead, including superintendence, administration, office expenses, B & O Tax and any other general expenses. If the changed work is done all or in part by a Subcontractor, the Subcontractor shall be allowed a fixed fee of 15% for all profit, overhead and all general expenses, and the Contractor shall be allowed a markup of 5% of Subcontractor's actual cost (before profit and overhead) to cover the Contractor's profit, overhead and all general expenses on the changed work performed by the Subcontractor.

8.6.4. The District will make the final determination of charges or credits for the Work covered by the Approved change. In the event the Contractor does not agree with the amount of charges or credits, Contractor shall submit a Contractor's claim in accordance with SECTION C, GENERAL CONDITIONS, LEGAL, CONTRACTOR'S CLAIMS.

8.7. DELAYS AND EXTENSIONS OF TIME

8.7.1. If the Contractor is delayed at any time in the progress of the Work by any of the causes listed below, the Contract Time may be extended by Field Work Order/Change Order for such reasonable time as the District shall determine. All decisions by the District regarding extensions of time shall be final. The Contractor agrees to complete the Work within the Contract Time as thus extended. Such extensions shall postpone the beginning of the period for payment of liquidated damages, if provided for in the Contract, but they and the events producing them shall not be grounds for claim by the Contractor for damages or for additional costs, expenses, overhead or profit or other compensation unless, and only to the extent that the District causes the delay, in which event the District shall compensate the Contractor and any Subcontractors suffering delay damages in the amount of their field expenses during the delay plus 15% of the field expenses as compensation for the cost of Superintendence, overhead, bond, profit and any other general expenses. The parties may, however, agree on a different amount if they so choose.

8.7.1.1. Fire, strikes, lockouts, labor disputes, pickets, war, acts of the public enemy, Acts of God.

8.7.1.2. Field Work Order/Change Orders.

8.7.1.3. Acts of performance or delays in performance caused by persons other than the Contractor and other than persons acting for and on behalf of the Contractor.

8.7.1.4. Causes beyond the control of the Contractor, the delays from which could not have been avoided through the exercise of reasonable care, prudence, foresight and diligence on its part and that of its Subcontractors.

8.7.2. All claims for extension of the Contract Time shall be made in writing and submitted to the District in accordance with SECTION C, GENERAL CONDITIONS, LEGAL, CONTRACTOR'S CLAIMS no more than ten (10) days after the Contractor knows or by reasonable diligence should know of the event causing or likely to cause the delay; otherwise, they shall be waived. In the case of a continuing cause of delay, only one (1) claim is necessary.

8.7.3. Avoidable delays in the prosecution or completion of the Work, for which no time extension shall be granted, shall include all delays which in the opinion of the District could have been avoided by the exercise of care, prudence, foresight and diligence on the part of the Contractor. The following list is non exclusive, but is representative of avoidable delays within the meaning of the Contract and shall not be a basis for an extension of the Contract Time:

- delays caused by rejected claims for extension of time or changed work by Contractor;
- delays caused due to rejected Work;
- delays to a part of the Work which may in themselves be unavoidable but do not necessarily prevent or delay the prosecution of other parts of the Work nor the completion of the whole Work within the Contract Time herein specified;
- reasonable loss of time resulting from the necessity of submitting Shop Drawings to the District for approval and from making of surveys, measurements, and inspection;
- such interruptions as may occur in the prosecution of the Work on account of the reasonable interference of other contractors employed by the District which do not necessarily prevent the Completion of the whole Work within the time agreed upon.

8.7.4. No claim for delay shall be allowed on account of the District's failure to furnish Contract Drawings until ten (10) days after a written request for such Drawings has been made by the Contractor.

8.7.5. All changes of the Contract Time must be in writing and agreed upon by the District.

8.8. SUSPENSION OF WORK

Whenever, in the District's opinion, a suspension of the Work is necessary either in whole or in part because of conditions unfavorable to prosecution of the Work or failure of the Contractor to carry out any of the provisions of the Contract, the District may immediately order suspension of the operation. Any suspension of the Work by the District shall in no case relieve the Contractor from its obligations under the Contract. The District shall not be required to pay for any standby time or damages arising from such a suspension. The Contractor shall not suspend operations without obtaining the prior written permission of the District.

In preparation for or during the suspension of the Work, Contractor shall take necessary steps at Contractor's expense to prevent damage to or deterioration of the Work.

8.9. USE OF COMPLETED PORTIONS

8.9.1. Whenever, as determined by the District, the Project or any part thereof is in a condition suitable for use and the best interest of the District requires such use, the District may take possession of or use the Project or such part thereof.

8.9.2. All necessary repairs or renewals in the Project or part thereof so used, not due to ordinary wear and tear, but due to defective materials or workmanship or to the operations of the Contractor, shall be completed within the warranty period as specified in SECTION C, GENERAL CONDITIONS, LEGAL, WARRANTY, of the Contract Documents, and at the expense of the Contractor.

8.9.3. The use by the District of the Project or part thereof as contemplated in this Paragraph shall in no case be construed as constituting acceptance of the Project or any part thereof. Such use shall neither relieve the Contractor of any of its responsibilities under the Contract, nor act as a waiver by the District of any of the conditions thereof, PROVIDED, that the Contractor shall not be responsible for the cost of repairs or renewals required due to ordinary wear and tear as a result of such use or damage due to the District's negligence or misuse of the Project.

9. PAYMENT

9.1. WAGES PAID BY CONTRACTOR

9.1.1. The Contractor and its Subcontractors shall fully comply with all applicable provisions of RCW Chapter 39.12 concerning payment of prevailing wages, including the filing and payment of fees for all required statements and affidavits, and shall pay and provide wages and benefits to their employees employed in the performance of this Contract which are not less than those fixed by the Washington Department of Labor and Industries for work of like character. It shall be the responsibility of the Contractor to ensure that the appropriate classification of work and

prevailing wage rate is paid for the county in which the Work is performed. Questions regarding Prevailing Wage should be directed to the Prevailing Wage section of the Department of Labor & Industries, ESAC Division, P.O. Box 44540, Olympia, Washington 98504-4540 by calling (360) 902-5335 or on their web site at www.lni.wa.gov/TradesLicensing/PrevWage/WageRates/default.asp. The District does not guarantee that labor can be procured for the minimum wages shown on the referenced schedules. The rates listed are minimum only, below which the Contractor cannot pay. The Contractor may be required to furnish to the District at any time acceptable evidence of wage rates and amounts paid by it or its Subcontractors.

9.1.2. For all electrical line or substation maintenance and for all electrical line or substation construction Work under this Contract (including pole testing and tree trimming) the current prevailing wage rates for such Work shall be the current and prevailing wage rates, employee benefits and working conditions expressed through collective bargaining for the I.B.E.W., Local 77 construction membership. The Contractor may determine the wages in effect at the time this Contract is bid by contacting the International Brotherhood of Electrical Workers, Local Union No. 77, 77 Angus Square, Kennewick, Washington 99336 (509-783-4136).

9.1.3. Any dispute between the Contractor or any of its Subcontractors and the District over the appropriate wage rate under this provision or RCW Chapter 39.12 shall be subject to arbitration pursuant to RCW 39.12.060.

9.2. TIME AND MANNER OF PAYMENT TO CONTRACTOR

9.2.1. **IMPORTANT!** No payment will be made to the Contractor until the Contractor and each and every Subcontractor has submitted to the District a "Statement of Intent to Pay Prevailing Wages" in compliance with RCW 39.12.040. Final payment for Work performed pursuant to these Contract Documents shall not be issued by the District until all requirements of RCW Chapter 39.12 have been satisfied.

In the event any dispute arises between the District, the Contractor, a Subcontractor, and any laborer, worker or mechanic, or any of them, as to what are the prevailing wage rates for work of a similar nature, which dispute cannot be settled by the parties in interest, including labor and management representatives, the matter shall be referred for arbitration to the Director of the Department of Labor and Industries, whose decision shall be final, conclusive and binding on all parties involved in the dispute.

9.2.2. On the first day of each month the Contractor shall submit to the Engineer for approval a detailed Contractor's Application and Certificate for Payment for the value of the Work completed during the previous month. Within 30 days after receipt of a properly completed invoice or receipt of goods or services, whichever is later, the amounts so determined, less previous payments, and less such sums as the District may be entitled to retain under the provisions of the Contract, shall be paid to

the Contractor (see SECTION C, GENERAL CONDITIONS, PAYMENT, PAYMENTS WITHHELD (RETAINAGE)).

9.2.3. If requested in writing by the District, the Contractor shall include with each Request for Payment (after the first) a statement under penalty of perjury that all Subcontractors have been paid less earned retainage as their interest appeared in the last payment received, and shall be accompanied by a signed receipt from the Subcontractors that they have received payment for the previous month's work (less earned retention) and a similar statement under penalty of perjury by these Subcontractors stating that all Subcontractors, suppliers, wages, fringe benefits and taxes arising out of such subcontracts have been paid as their interest appeared in the last payment received. No Request for Payment will be processed unless accompanied by both the statements and receipts requested.

9.2.4. Materials and equipment that are installed in place will be considered in determining the value of Work completed. Payment may be made on the Contractor's receipted purchase invoice amount (i.e., Contractor's actual cost) of materials satisfactorily stored and on-hand.

9.2.5. The Contractor shall advise the District, to the extent feasible, of all state sales taxes and/or compensating use taxes paid to a state or political subdivision outside the State of Washington, in connection with the equipment and materials furnished, and Work performed.

9.2.6. The making of any payment to the Contractor under the Contract shall not relieve the Contractor of any of its obligations thereunder. The Contractor is obligated to complete the Contract in its entirety and to deliver to the District such completed Work as is specified in the Contract.

9.2.7. The Engineer may withhold approval of payment to such extent as may be necessary to protect the District from loss on account of:

- Defective Work not remedied.
- Claims filed or reasonable evidence indicating probable filing of claims.
- Failure of the Contractor to make payments properly to Subcontractors or for material or labor.
- A reasonable doubt exists that the Work can be completed for the outstanding balance of the Contract Price.
- Damage to another Contractor.

- All security badges and keys have not been returned to the District.
- Failure of the Contractor to keep its Work progressing in accordance with its Work schedule.
- Failure of the Contractor to provide all drawings, manuals and other information required by the Contract.

Nothing in this paragraph or SECTION C, GENERAL CONDITIONS, PAYMENT, ACCEPTANCE AND FINAL PAYMENT, shall make any laborers, materialmen, suppliers or Subcontractors third party beneficiaries of this Contract or obligate the District to withhold any funds except in the District's sole discretion. Pursuant to RCW 39.76, when all or a part of a payment is going to be withheld for unsatisfactory performance or if the payment request does not comply with the requirements of the Contract, the District shall notify the Contractor in writing within eight (8) working days after receipt of the payment request stating specifically why part or all of the payment is being withheld and what remedial action must be taken by the Contractor to receive the withheld amounts. When the above grounds are removed, payment shall be made within 30 days for any amount withheld because of them.

9.2.8. IMPORTANT! No payment will be made to the Contractor for any Work performed under this Contract until a properly completed Insurance Certificate and/or the Performance and Payment Bond is received by the District. See SECTION C, GENERAL CONDITIONS, INSURANCE, CERTIFICATION AND CANCELLATION OF INSURANCE and SECTION B, BIDDING INSTRUCTIONS, PERFORMANCE AND PAYMENT BOND.

9.2.9. Payments made to the Contractor shall not constitute acceptance by the District of Work that is defective or deficient, in whole or in part, regardless of whether the defect or deficiency is patent or latent or known or unknown, and such payments shall not constitute a waiver by the District of any rights or remedies it may otherwise have under these Contract Documents or otherwise.

9.3. PAYMENTS BY CONTRACTOR

9.3.1. The Contractor shall pay (a) for all transportation and utility services not later than the 30th day of the calendar month following that in which services are rendered; (b) for all materials, tools, and other expendable equipment to the extent of 90% of the cost thereof, not later than the 30th day of the calendar month following that in which such materials, tools, and equipment are delivered at the site of the Project, and the balance of the cost thereof not later than the 30th day following the completion of that part of the Work in or on which such materials, tools, and equipment are incorporated or used, and (c) to each of its Subcontractors, not later than the 10th day following each payment to the Contractor, the respective amounts allowed the

Contractor on account of the Work performed by its Subcontractors to the extent of each Subcontractor's legitimate interest therein. The Contractor shall require, by an appropriate agreement with each Subcontractor, each Subcontractor to make payments to its suppliers and Subcontractors in a similar manner.

9.3.2. In the event a payment to a supplier or Subcontractor is disputed, the Contractor shall notify the District of such dispute.

9.4. DETERMINATION OF QUANTITIES FOR PAYMENT

The quantity of Work to be paid for any item for which a Unit Price is fixed in the Contract shall be the number of units of Work satisfactorily completed in accordance with the Contract Documents, as determined by the Engineer. The quantity of Work to be paid for any item for which a lump sum price is fixed in the Contract shall be based on the percentage of Work satisfactorily completed in accordance with the Contract Documents, as determined by the Engineer. No payment will be made for Work done outside of the prescribed or ordered limits. Measurements and computations will be made by such methods as the Engineer may consider appropriate for the class of Work measured.

9.5. PAYMENT FOR UNCORRECTED WORK

If, in the opinion of the Engineer, it is inexpedient, impractical, or otherwise not in the best interest of the District to correct Work which has been damaged, which is faulty, or which has not been furnished in accordance with the Contract, an equitable reduction in the Contract Price shall be made therefor. The District shall have the discretion to set a reasonable reduction in the Contract Price, taking into account the cost of repairing or replacing the nonconforming Work, the diminution in value of the Work if not required or replaced, or other means of calculating such reduction.

9.6. PAYMENTS WITHHELD (RETAINAGE)

9.6.1. Pursuant to RCW Chapter 60.28 the District may be required to withhold an amount of 5% of all monies earned by the Contractor under this Contract as a trust fund for the protection and payment of any person who shall supply labor or materials for the carrying on of the Work and for any state taxes due under RCW Title 82.

9.6.2. The District shall have the right to withhold from payment to the Contractor and retain such an amount or amounts, in addition to the reserved percentage hereinabove described, as may be necessary to pay just claims for labor, materials, and services rendered in and about the Work. The District shall have the further right, acting as agent of the Contractor, to apply such retained amounts to the payment of such just claims. Nothing in this paragraph shall make any laborer,

materialman, supplier, or Subcontractor third party beneficiaries under this Contract nor obligate the District to withhold any such funds.

9.6.3. At the Contractor's option, the monies reserved as retainage shall be held by the District, or deposited in an interest bearing account at a bank, or placed in escrow at a bank or trust company, all as more fully provided in Chapter 60.28, Revised Code of Washington.

9.6.4. Pursuant to RCW Chapter 60.28, the Contractor may submit a bond in lieu of retainage that the District would otherwise keep under the terms of this Contract and pursuant to applicable law. In the event the Contractor fails at any time to pay persons protected under RCW Chapter 60.28 or the District has reason to believe that the District or other obligee under the bond has a claim against the retainage or for other good cause, the District may, at its option resume retaining from monies earned by the Contractor such amount as it would otherwise be entitled to retain had the bond not been accepted. Notwithstanding the District's resuming such retainage, said bond shall remain in full force and effect to the extent of its penal sum, limited to the amount of retainage released to the Contractor. After the Contractor has paid protected persons or otherwise cured any default, the District may, at its option, again release retainage pursuant to the terms of the bond.

9.7. ACCEPTANCE AND FINAL PAYMENT

9.7.1. When the Contractor has completed the Work in accordance with the terms of the Contract Documents, the Contractor shall submit to the Engineer the Certificate and Release statement concerning claims in the form specified in SECTION E, CONTRACT DOCUMENT FORMS, of these Contract Documents and such other completed documents as may be required for the release of monies held.

9.7.2. The Certificate and Release shall be prepared on the basis of the Contract, including all authorized Field Work Order/Change Orders, inclusive of claims of the Contractor which have not been accepted by an executed Field Work Order/Change Order. The Certificate and Release shall constitute a waiver of all claims by the Contractor except for unsettled claims specifically stated in the Certificate and Release.

9.7.3. The Certificate and Release shall warrant that the Contractor has fully completed the Work included in the Contract and has fully paid for labor, materials, equipment, services, taxes and all other costs and expenses of every nature and kind whatsoever resulting from this Contract and certifies that all contractual conditions have been satisfied. Such Certificate and Release shall also state the amount and nature of all present and all future claims that the Contractor may have against the District relative to this Contract.

9.7.4. After receipt of a properly completed Certificate and Release, the Engineer will, within a reasonable time, make a determination as to the date of Completion of all Contract Work and make a recommendation to the District relative to acceptance of the Work. Such a recommendation shall not constitute a recommendation of acceptance of Work not furnished in accordance with the terms of the Contract. The Certificate and Release will be reviewed in the same manner as a Request for Payment, pursuant to SECTION C, GENERAL CONDITIONS, PAYMENT, PAYMENTS BY CONTRACTOR.

9.7.5. Upon receipt of the Certificate and Release, and other documents necessary for the release of monies held and the Engineer's recommendation relative to acceptance of Work, the District will, within a reasonable time, take action on the Certificate and Release. Such action shall be subject to the conditions of the Performance and Payment Bond, legal rights of the District, required warranties, and correction of faulty Work after final payment. The District shall have the right to retain from any payment then due the Contractor, so long as any bills or claims against the Contractor remain unsettled and outstanding, a sum sufficient, in the opinion of the District, to provide for the payment of the same. It is also understood and agreed that, in case of any breach by the Contractor of the provisions hereof, the District may retain from any payment or payments which may become due hereunder, a sum sufficient, in the opinion of the District, to compensate for all damages occasioned by such breach, including such damages arising out of any delay on the part of the Contractor.

9.7.6. After the expiration of 45 days from the Completion of all Contract Work and after the District has received the Department of Revenue's certificate, and the District is satisfied that the taxes certified as due or to become due by the Department of Revenue are discharged, and the claims of materialmen and laborers who have filed their claims, together with a sum sufficient to defray the cost of foreclosing the liens of such claims, and to pay attorneys fees, have been paid, the District may withhold from the remaining retained amounts for claims the District may have against the Contractor and shall pay the balance, if any, to the Contractor the fund retained by it or release to the Contractor the securities and bonds held in escrow.

If such taxes have not been discharged or the claims, expenses and fees have not been paid, the District shall either retain in its fund or in an interest bearing account, or retain in escrow, at the option of the Contractor, an amount equal to such unpaid taxes and unpaid claims together with a sum sufficient to defray the costs and attorneys fees incurred in foreclosing the lien of such claims, and shall pay, or release from escrow, the remainder to the Contractor.

In any event, the District will, within 60 days after Completion of all Contract Work, release and pay in full to the Contractor the amounts retained or withhold from such retained funds a sum sufficient to pay the unpaid taxes, unpaid claims, attorneys fees

and costs and claims the District may have against the Contractor as enumerated above and release the remainder, if any, to the Contractor.

9.7.7. If any liens or taxes remain unsatisfied after final payment is made, the Contractor shall refund to the District such amounts as the District may have been compelled to pay in discharging such liens or taxes, including all costs and reasonable attorneys fees.

9.7.8. The Contractor shall be responsible for payment to the District of all direct and indirect costs associated with the handling of taxes and liens and notices of intent to file liens. Such costs shall include, but not be limited to, administration, clerical, accounting and legal costs.

9.7.9. Any action taken by the District pursuant to this section shall not release or relieve Contractor and/or Contractor's successors, assigns, and agents from any past, present or future obligations, warranty, or duties under the Contract or pursuant to state, federal, or local law.

9.8. CONTRACT COMPLETION

The Contract will be complete when all Work has been finished, the final inspection made by the Engineer and final acceptance of the Work has been adopted by District resolution. Issuance of any statement or submission of any form by the District relating to Project completion to any government agency for the purpose of such agency's administrative functions shall not affect or modify the foregoing requirements for determination of Contract Completion as between the District and the Contractor.

9.9. TAXES

The Contractor shall be liable for all federal, state and local taxes payable in connection with or arising from the Work. The cost of any and all such taxes shall be included in the Contract Price (except for Washington State sales taxes, an amount equal to which the District will pay to the Contractor in addition to the Contract Price in accordance with the procedures established in these Contract Documents). It is the responsibility of the Contractor to determine, in conjunction with the appropriate federal, state or local authorities, the nature and amount of any taxes payable as a result of the Work.

10. DISTRICT OPERATIONS

10.1. DISTRICT OPERATIONS

The Contractor shall schedule all Work so as not to interfere with the operations of the District. Where such interference is essential to prosecution of the Contract, special

arrangements shall be made and the written consent of the District shall be obtained prior to commencing the Work.

10.2. DISTRICT CONSTRUCTION

The District reserves the right to engage in activities in connection with the Work which are not included in the Contract, either by the District's employees or agents or by the use of other contractors or agencies and the employees or agents of the same.

10.3. MODIFICATION OF WORK SCHEDULE

10.3.1. Whenever in the District's opinion it is necessary to do so in order to ensure the safe and proper completion of the Contract, the District may determine the order of precedence and the time at which any portion or portions of the Work shall be commenced and carried on.

10.3.2. The District may modify the Work schedule when the Work is carried on in locations where the District is doing other work either by other contract or by its own employees or agents, in order that conflict may be avoided and so that the Work under this Contract will be harmonized with the work furnished under other contracts or being done in connection with the operations of the District. Nothing herein contained shall relieve the Contractor of any of its obligations or liabilities under the Contract.

11. PROJECT SITE MANAGEMENT AND SAFETY

11.1. CONTRACTOR'S SUPERINTENDENCE

The Contractor shall give efficient Superintendence to the Work, using its best skill and attention. During the progress of the Work, the Contractor shall have in constant attendance at the Project site a competent superintendent and necessary assistants, all subject to the District's approval. The superintendent shall not be changed, except with the consent of the District, unless the superintendent ceases to be in the Contractor's employ. The superintendent shall represent the Contractor and all directions given to the superintendent shall be as binding as if given to the Contractor. Important directions shall be subsequently confirmed in writing upon written request. Contractor agrees that the superintendent shall have authority to execute any agreements on Contractor's behalf.

11.2. LANDS PROVIDED BY DISTRICT

Unless otherwise provided in SECTION D, SUPPLEMENTAL CONDITIONS or elsewhere in these Contract Documents, the District will provide the lands upon which

the Work under this Contract is to be furnished, together with the right of access to such lands. The Contractor shall confine all equipment, storage of materials, and operations to such limits as may be directed by the District, and shall not unreasonably place materials on the premises.

11.3. FACILITIES PROVIDED BY CONTRACTOR

The Contractor shall provide at its own expense and with no liability to the District any additional land and access thereto, not shown on the Contract Drawings or described in the Specifications, that may be required for temporary facilities or storage of materials. The Contractor shall confine its equipment, storage of materials and operation of its workers to those areas described in the Contract Drawings and Specifications and such additional areas as it may provide at its own expense. The District and/or Architect/Project Engineer will not assume any responsibility for the security or protection of any materials and equipment stored on the site or elsewhere by the Contractor.

11.4. SURVEYS

The District will furnish the surveys necessary to establish certain bench marks, base lines and property boundaries specifically noted on the Contract Drawings and such surveys as are specifically described in SECTION D, SUPPLEMENTAL CONDITIONS.

11.4.1. All bench marks, base lines, property boundaries and other reference and construction points, as originally established by the District, shall thereafter be maintained by the Contractor who shall be responsible for keeping their accuracy and who shall pay to the District the reasonable cost of re-establishing them if they are disturbed.

11.4.2. The Contractor shall retain a licensed surveyor to lay out its work from established points and lines indicated on the Contract Drawings, shall furnish any required engineering for the layout from such points, and shall be responsible for the execution of the Work to such lines and grades. Contractor shall maintain and preserve said reference points and other selected layout points and lines until their removal is authorized. If destroyed prior to authorized removal, they will be accurately replaced by the Contractor at no expense to the District.

11.5. PROTECTION OF PROPERTY

11.5.1. The Contractor shall continuously maintain adequate protection of all its Work, the District's property, and adjacent public and private property from damage, injury, or loss arising in connection with the Work. The Contractor shall remedy any damage, injury or loss resulting from lack of adequate protection. Immediate response must be taken to rectify the damage. If the Contractor does not

rectify the damage to the District's satisfaction and level of service, the District shall make any repairs necessary at the Contractor's expense.

11.5.2. The Contractor shall not enter upon public or private property for any purpose without obtaining permission from the proper public authority or private property owner.

11.5.3. Wherever Work under the Contract is undertaken on easements or rights-of-way over private property, or public right-of-way or franchise, all operations shall be confined to the limits of such easement, right-of-way, or franchise.

11.5.4. The Contractor shall protect and maintain all underground or above ground utilities and structures affected by the Work and all fences, and other improvements on property crossed by or adjacent to its operations, and any damage shall be repaired and restored by the Contractor at its expense in a Satisfactory manner. The Contractor will be held responsible for all damages caused by its Work to roads, trails, docks, ditches, walls, bridges, culverts, utilities, barricades, lights or other property, whether such damage be at the Project site, or caused from transporting or hauling to or from the site, and it shall repair or replace at its own expense all such damage in a Satisfactory manner, as determined by the District. Immediate response must be taken to rectify the damage. If the Contractor does not rectify the damage to the District's satisfaction, and level of service, the District shall make any repairs necessary at the Contractor's expense. The Contractor shall be responsible for replacing damaged services to the District's customers at the Contractor's expense. The Contractor shall also be required to provide items, at its expense, such as potable water, portable generators, portable sanitation units, mail delivery, sanitation service, or any other necessities required or otherwise specified to carry out the Work.

11.5.5. Contractor acknowledges that if temporary key(s) have been issued, the keys are issued for a limited period of time, that they must not be duplicated, and that keys are valuable items that require safeguarding. If key(s) are not returned within five (5) days of the Completion of Work, Contractor agrees to reimburse the District for associated re-keying expense.

11.6. SAFETY REQUIREMENTS

11.6.1. The Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and safety programs in connection with the Work. In the event that the Engineer or other District representatives are present for any purpose pursuant to this Contract, the Engineer and/or District representatives are not responsible for insuring adequate safety precautions and requirements are being followed by the Contractor, its agents, employees and Subcontractors.

11.6.2. The Contractor shall conduct the Work with due regard to adequate safety requirements and shall maintain its facilities and equipment in safe conditions. Contractor shall at its own cost and expense protect its employees, the District's employees and all other persons from risk of death, injury or bodily harm arising from or in any way connected with the Work under this Contract and any changes thereto. The Contractor shall conform to all current safety practices and shall strictly comply with all applicable federal, Washington State and local regulations regarding safety, including but not limited to, Occupational Safety and Health Act (OSHA), and Washington Industrial Safety and Health Act (WISHA), and all other regulatory agencies having jurisdiction. Contractor warrants that all equipment has been inspected and certified for its intended use in connection with the Work. Contractor shall ensure that all crewmembers have current licenses or certifications when necessary and applicable to the Work. Reports of all accidents shall promptly be submitted to the Engineer and to the District's Safety and Risk Management Department in writing, giving such data as may be required or requested.

11.6.3. The Contractor shall provide, erect, and maintain all necessary guards, barricades, temporary fences, suitable and sufficient warning lights, danger signals and signs, illumination, and shall take all necessary precautions for the protection of the Work and the safety of the public.

11.6.4. The Contractor shall meet all fire regulations and restrictions of each of the agencies having jurisdiction over any part of its operation.

11.6.5. If trench excavation in excess of 4 feet is required for the completion of the Project described in the Contract Documents, then the Contractor shall be required to furnish the necessary safety systems to meet the applicable RCW and WAC at no additional cost to the District.

11.6.6. If Work under this Contract will take place in a Permit Required Confined Space pursuant to Chapter 296-809, as now exists or as may be hereafter amended, the following shall be required as a condition of acceptance of a bid.

Contractor must provide a copy of the written permit required confined space program adopted by Contractor and verify that it is consistent with WAC 296-809-300. Such program must include but is not limited to provision, maintenance, and adequate training of employees for use of required equipment specified in WAC 296-809-400, implementation of a permit system required for entry.

Contractor must certify that employee training required by WAC 296-809-400 has been accomplished. This certification must:

- Contain each employee's name, the signatures or initials of the trainers, and the dates of training.

- Contain a statement that the Contractor has made the certification available for inspection by the Contractor's employees and their authorized representatives.

Contractor must designate rescue and emergency services upon which it will rely under WAC 296-809-50014. The Contractor shall provide a certification from the designated entity in a form similar to the following:

(Entity name) hereby declares its employees or representatives have been trained in rescue and emergency services necessary for permitted confined spaces as defined by WAC 296-809-400 and such rescue and emergency services will be made available to the Contractor during construction of (project name).

11.6.7. During construction, Contractor will coordinate entry operations with District personnel as required by WAC 296-809-500.

11.6.8. Upon completion of the work in the permitted confined space, Contractor will advise the District of any hazards confronted or created in the permitted confined space.

11.6.9. In addition to all other pre-qualifications and requirements, all Contractor personnel working in District substations or switchyards are required to watch a one (1) hour video at the District headquarters building that provides information about work practices and notifications required by the District when working inside these facilities. In addition, site-specific orientation of up to one (1) hour will be given to Contractor personnel at the jobsite prior to the start of any Work.

11.7. DUST AND SMOKE CONTROL

11.7.1. The Contractor shall constantly maintain the entire Work area free from dust and smoke which would cause a hazard or nuisance to nearby streets, orchards, crops, residences, businesses, or the operations of others performing work in the area, by sprinkling and other approved methods as required.

11.7.2. The Contractor is cautioned that dust can be a severe problem in the locality of the Work. No separate payment will be made for dust and smoke control, which the Contractor is required to provide. All costs involved in dust and smoke control shall be included in the Contract Price.

11.7.3. In the event that the Contractor does not adequately control dust, the District reserves the right to contract separately for additional dust control, deduct the cost involved from the Contract Price and adjust periodic payments as may be required to properly account for those costs. Further, the District will not be responsible

for any damage to the Work under the Contract resulting from separate dust control operations made necessary by the Contractor's failure to provide adequate dust control.

11.7.4. Contractor shall adhere to requirements of WAC 296-841 Respiratory Hazards.

11.8. CLEANUP

At the time of suspension for an extended period of all or any portion of the Work, at termination of the Work for any reason, or at Completion but before final acceptance by the District, the Contractor at its own expense shall remove from the District's property and from all public and private property all of its equipment, unused materials that the District has made no payment for, temporary structures, rubbish and waste materials resulting from its operations and leave the Project area in a neat and orderly fashion Satisfactory to the District. The Contractor shall at all times during the progress of the Work maintain the area in as neat and orderly a condition as operations will permit. In the event the Contractor fails to do so, the District may remove and store such equipment and unused materials and dispose of rubbish and waste at the expense of the Contractor. The cost of such removal, storage, and disposal may, at the District's discretion, be deducted from any payment due the Contractor and from the Contract Price.

11.9. SANITARY PROVISIONS

The Contractor shall furnish temporary toilet facilities of a type and number satisfactory to the government authorities having jurisdiction for all workers and inspectors employed on the Project. Such temporary toilet facilities shall be subject to the approval of the District as to location. The Contractor shall maintain the same in a sanitary condition from the beginning of the Work until Completion and shall then remove the temporary toilet facilities and disinfect the premises.

11.10. SECURITY

11.10.1. Contractor and its employees, and any Subcontractor and its employees who may have access to District information and/or documents that are considered sensitive or confidential under the Federal Energy Regulatory Commission's (FERC) Critical Energy Infrastructure Information (CEII) regulations shall treat such information as confidential and follow control, distribution and destruction guidelines as set forth by the District in the Non-Disclosure Agreement or as otherwise directed by the District.

11.10.2. Contractor, Contractor's employees, and each Subcontractor and its employees shall comply with the District's Security and Badging Program as may be amended. A copy of the Security and Badging Program is available from the District

upon request. The District will issue badges to Contractor's employees and all Subcontractors' employees who are authorized to enter or work at District facilities. The badging process requires that all Contractor's employees and all Subcontractors' employees working on District facilities obtain a photograph identification badge from the District. The Contractor is required to contact the District's Security Department to schedule an appointment for issuance of identification badges. Contractor's employees and Subcontractors' employees will be required to show proof of identity before the District will issue the photograph identification badge. Final payment may not be made until all security badges and keys issued to Contractor's employees and all Subcontractors' employees have been returned to the Project Manager.

11.11. DRUG FREE WORKPLACE

11.11.1. The Contractor and its Subcontractors shall fully comply with all applicable provisions of 41 U.S.C § 701, the Drug-Free Workplace Act of 1988.

11.11.2. The Contractor and its Subcontractors shall immediately remove any employee from further work if it is determined that the person is not fit for duty for any reason including the employee's use of alcohol, controlled substances or legend drugs, as defined in the District's Fitness for Duty Policy and Guidelines, a copy of which is available from the District upon request.

11.11.3. The failure of the Contractor or any Subcontractor to comply with this paragraph shall be deemed a default of the Contract as set forth in SECTION C, GENERAL CONDITIONS, LEGAL, CONTRACTOR'S DEFAULT.

11.12. VIOLENCE IN THE WORKPLACE

11.12.1. The carrying or possession of firearms or other weapons is prohibited at all times in District buildings or on District property, including District parking lots and in vehicles. The carrying or possession of firearms or other weapons is prohibited on any other District location while performing duties for the District under this Contract.

11.12.2. The Contractor and its Subcontractors shall immediately remove any employee from further work if it is determined that the person is carrying or in possession of firearms or other weapons, as defined in the District's Violence in the Workplace Policy, a copy of which is available from the District upon request.

11.12.3. The failure of any Contractor or its Subcontractors to comply with this paragraph shall be deemed a default of the Contract as set forth in SECTION C, GENERAL CONDITIONS, LEGAL, CONTRACTOR'S DEFAULT.

11.13. WORKER'S RIGHT-TO-KNOW

Prior to the issuance of the Notice to Proceed, the Contractor shall provide to the District's Procurement and Contract Services Department an Inventory List for Hazardous Chemicals, and Material Safety Data Sheets (MSDS) for all hazardous products to be used on District property as a part of this Contract. The MSDS shall, at a minimum, meet the following criteria:

- Be complete, legible and in the English language
- Be current (no older than five [5] years or, if older than five [5] years, Contractor shall provide documentation from product manufacturer stating that the product is unchanged and the MSDS is accurate)

The Contractor shall provide to the Project Engineer additional MSDS for any products not initially listed on the Inventory List of Hazardous Chemicals that are used on District property. Contractor shall request from the Project Engineer any MSDS for products furnished by the District.

The District reserves the right to disallow the use of any product or limit product application methods it deems to pose an unacceptable risk to District personnel or the environment.

The District reserves the right to determine the acceptability of the MSDS submitted by Contractor. Failure of the Contractor to submit the required MSDS as stated above may result in a Stop Work Directive or withholding of progress payments until the deficiency(ies) is corrected.

Any hazardous waste generated by the Contractor must be properly disposed of by the Contractor or any Subcontractor. Products requiring MSDS sheets that are not completely used by the Contractor shall be removed from District property by the Contractor at the completion of the Work, at Contractor's expense, unless specifically requested otherwise by the District.

END OF SECTION C

SECTION D
SUPPLEMENTAL CONDITIONS

TABLE OF CONTENTS

6. LEGAL	2
6.1. WARRANTY	2
8. PROGRESS AND COMPLETION	2
8.2. TIME FOR PERFORMANCE OF WORK	2
8.3. PRECONSTRUCTION CONFERENCE	3
8.7. DELAYS AND EXTENSIONS OF TIME	3
8.11. SUBSTANTIAL COMPLETION (NEW SECTION)	4
9. PAYMENT	4
9.2. TIME AND MANNER OF PAYMENT TO CONTRACTOR	4

6. LEGAL

6.1. WARRANTY

Revise as follows:

6.1.2. The warranty period will be revised from 1 year to 2 years.

8. PROGRESS AND COMPLETION

8.2. TIME FOR PERFORMANCE OF WORK

8.2.1 Contract Milestone Dates (New Section)

This section sets forth mandatory dates for completion of various portions of the Work (Milestone Dates). Time is of the essence. The Contractor shall commence work immediately upon receipt of Notice of Award and shall plan labor, supervision, equipment, and logistics to meet the following contractual Milestone Dates. The following Milestone Dates assume the Contractor has been awarded the Contract and issued Notice of Award by the District on or before .

Task	Completion Date
Post-Award Meeting	
Project Schedule Submittal	
First Submittal Package (as defined in Section 01300, Administrative Requirements)	
Second Submittal Package (as defined in Section 01300, Administrative Requirements)	
Third Submittal Package (as defined in Section 01300, Administrative Requirements)	
Shop Fabrication and Inspection	
Delivery of Equipment Building and all accessory electrical equipment onsite	
Delivery of all pumps and fish screening system onsite	
Installation and Test Acceptance (as defined in Section 01661, Operational Acceptance Testing)	
Fourth Submittal Package (as defined in Section 01300, Administrative Requirements)	
Substantial Completion	

8.3. PRECONSTRUCTION CONFERENCE

This section will be revised to read "Post-Award Meeting."

8.7. DELAYS AND EXTENSIONS OF TIME

8.7.6. Liquidated Damages (New Section)

8.7.6.1. For each and every day that any portion of the Work remains unfinished after expiration date of Contract Milestone Dates above, the Contractor shall pay to the District, not as a penalty, but as liquidated damages, the following amounts. Any day charge shall include weekend and holidays.

- Submittals - \$500 per day per submittal package as defined in Section 01300, Administrative Requirements.
- Accessory Electrical Equipment Delivery - \$1,000 per day.
- Pumps and Screen Delivery - \$3,000 per day per pump and screen assembly.
- Installation and Test Acceptance - \$5,000 per day.

Because of the difficulty in computing the actual damages which will result, the amount of Liquidated Damages as set forth above is hereby estimated, agreed upon and determined in advance by the parties hereto as a reasonable forecast of the actual damages which the District will suffer by the failure of the Contractor to complete the Work within the Contract Time agreed upon for its completion. Such damages shall include the cost of all office and field engineering, and inspection incurred after the time fixed for completion in the Contract Documents.

The Contractor will not be held liable for liquidated damages for late Installation and Test Acceptance, where failure to meet the specified date is due to delay in completion of the pump station by the Installation Contractor. Any delays of Installation and Test Acceptance after completing the pump station shall be subject to liquidated damages.

The District may retain from any monies due the Contractor after the time fixed in the Contract Documents for completion of the Work such amount as may be necessary to pay said Liquidated Damages. Should such amounts due to the Contractor not be sufficient to pay such damages, the Contractor shall immediately pay the deficiency to the District.

The execution of the Contract for the Work herein contemplated shall constitute acknowledgement by the Contractor that it understands, has estimated and ascertained and agrees that the District will actually suffer damages in the amount herein fixed for

each and every day during which the Completion of the Work is delayed beyond the expiration of the Contract Time, including weekends and holidays.

8.7.6.2. Limitations on Liquidated Damages. The District shall not assess liquidated damages under this Contract in an amount in excess of **15%** of the Contract Price.

8.7.6.3. Limitation on Consequential Damages. Except as provided in Liquidated Damages, supra, the Contractor shall not be liable to the District for any loss of profits or revenue, loss of use of power generating equipment, cost of capital, cost of purchased or replacement power or other consequential damages resulting from defects in goods furnished or Work performed in furtherance of the Contract. This limitation shall not apply to the extent of insurance required under this Contract nor shall it apply to limit Contractor's obligations under SECTION C, GENERAL CONDITIONS, LEGAL, PATENTS AND ROYALTIES.

8.11. SUBSTANTIAL COMPLETION (NEW SECTION)

When the Contract Work has progressed to the extent that the District has full use and benefit of the facilities, both from the operational and safety standpoint, and only minor incidental Work, replacement of temporary substitute facilities, or correction or repair remains to physically complete the total Contract, the Engineer may determine the Contract Work is substantially complete.

9. PAYMENT

9.2. TIME AND MANNER OF PAYMENT TO CONTRACTOR

9.2.10. Payment Schedule (New Section)

Payment shall be made on the following schedule:

- The District will make no payments for approval of the Project Schedule
- Payment number one in the amount of 10 percent of the Contract Price following the District approval of the first submittal package.
- Payment number two in the amount of 5 percent of the Contract Price following the District approval of the second submittal package.
- Payment number three in the amount of 15 percent of the Contract Price following the District approval of the third submittal package.
- Payment number four in the amount of 10 percent of the Contract Price following the District-approved delivery of the accessory equipment.

- Payment number five in the amount of 35 percent of the Contract Price following the District-approved delivery of the pumps and screens.
- Payment number six in the amount of 20 percent of the Contract Price following the District-approved completion of the installation and testing of the pumps and accessory equipment.
- Payment number seven in the amount of 5 percent of the Contract Price following the District-approved submittal of the fourth submittal package.

All amounts paid to the Contract shall be subject to a 5 percent retainage by the District. Contractor shall invoice for the appropriate amount of sales tax in addition to the above shown payment amount. If payment number six is delayed by more than 30 days due to failure of the Installation Contractor to complete the pump station structure, the District will pay the Contractor interest on the unpaid portion of payment number six in the amount of one-half of one percent (1/2%) per month, prorated for each day of the delay after 30 days.

END OF SECTION D

SECTION E

CONTRACT DOCUMENT FORMS

TABLE OF CONTENTS

1. BID BOND	2
2. BID PRICE SCHEDULE	3
3. BID PROPOSAL	5
4. UNIT PRICE SCHEDULE FOR CHANGED WORK (ALSO IN INSTRUCTIONS TO BIDDERS)	7
5. LIST OF SUBCONTRACTORS	8
6. NONCOLLUSION AFFIDAVIT OF PRIME BIDDER	9
7. CONTRACTOR'S APPLICATION AND CERTIFICATE FOR PAYMENT	10
8. CERTIFICATE AND RELEASE	12
9. INSURANCE COVERAGE CHECKLIST	14
10. INVENTORY LIST OF HAZARDOUS CHEMICALS	15
11. NOTICE OF AWARD	16
12. NOTICE TO PROCEED	17
13. PERFORMANCE AND PAYMENT BOND	18
14. RETAINAGE INVESTMENT	20
15. CONTRACT	21
16. FIELD WORK ORDER/CHANGE ORDER	23
17. INSPECTION ELEMENTS - SUMMARY MATRIX	25

1. BID BOND

KNOW ALL MEN BY THESE PRESENTS: that _____ as Principal(s) (hereinafter called the Principal) and _____, as a Surety licensed to do business in the State of Washington (hereinafter called the Surety), are held and firmly bound unto Public Utility District No. 1 of Chelan County, Washington, (hereinafter called the Obligee) in the amount of [bidder fill in only one blank] \$_____ or _____% of the Bid Price submitted as part of this bid, for the payment of which, well and truly to be made, we bind ourselves, our heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

EXECUTED this day of , 20____.

WHEREAS, said Principal is submitting herewith a Bid Proposal for:

07-31, Chelan Pump Station – Pump Procurement

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH that if said Principal shall be awarded the Contract which said Principal has proposed to undertake, and shall enter into a Contract pursuant to such award and give bond for the faithful performance of the Contract, and payment in full to Subcontractors and laborers, materialmen and suppliers, then this obligation shall be null and void otherwise, the amount hereinabove specified in this Bond shall be paid to the Obligee as liquidated damages, all in accordance with Revised Code of Washington, Section 54.04.080.

(SURETY)
By _____

Printed Name_____

Title _____

Street Address _____

Mailing Address_____

City/State/Zip_____

(PRINCIPAL)
By _____

Printed Name _____

Title _____

Street Address _____

Mailing Address _____

City/State/Zip _____

2. BID PRICE SCHEDULE

To: PUBLIC UTILITY DISTRICT NO. 1 OF CHELAN COUNTY
327 NORTH WENATCHEE AVENUE
WENATCHEE, WASHINGTON 98801

Having carefully examined the Contract Documents, including Specifications and Drawings entitled **07-31, Chelan Pump Station – Pump Procurement**, as well as the premises and conditions affecting the Work, the undersigned hereby proposes to furnish all labor and material and to perform all Work on the Project, **Schedule ____**, as required by and in strict accordance with the Contract Documents for the following sum:

Item	Description	Unit	Unit Price	Total Price
1.	Specification Section 11215 11305, Schedule ____ Pumps and Motors, inspections and testing.	LS	N/A	= \$ _____
2.	Specification Section 13120 Fish Screening System.	LS	N/A	= \$ _____
3.	Specification Section 13121 Equipment Building system.	LS	N/A	= \$ _____
4.	Division 16 Electrical, inspections and testing.	LS	N/A	= \$ _____
5.	Specification Section 01660 01661 Schedule ____ Pumps and Motors, inspections and testing.	LS	N/A	= \$ _____
6	Installation/Start-up Supervision 30 days	LS	\$ ____ per day	= \$ _____
	Total Bid Price		TOTAL (not to include WSST)	\$ _____

Total Lump Sum Bid Price Including **Schedule** Pumps and Motors: For all Work on the Project defined by the Contract Documents

_____ (words)
\$ _____ (numerals).

The Total Bid Price stated on Page 1 of the Bid Proposal must equal the Total Lump Sum Bid Price for the highest value schedule listed above.

ADDITIVE ALTERNATE PRICES

5.	5-Year Preventative Maintenance Program for Schedule ____ as specified in Section 11215 11305 (Optional).	LS	N/A	= \$ _____
6.	Additional days of Installation/Startup Supervision	Per day		= \$ _____
7.	Extended equipment warranty Additional one year Additional two years Additional three years Additional four years	LS		= \$ _____ = \$ _____ = \$ _____ = \$ _____

Note: All additive alternate prices shall be exclusive of Washington State Sales Tax.

Submitted By: _____

(Name of Bidder – typewritten or printed)

(Signature and Title)

Address: _____

(Business Address – typewritten or printed)

3. BID PROPOSAL

TO: PUBLIC UTILITY DISTRICT NO. 1 OF CHELAN COUNTY
327 NORTH WENATCHEE AVENUE
P.O. BOX 1231
WENATCHEE, WASHINGTON 98807

We, the undersigned hereby agree to furnish all the labor, materials, tools, equipment, facilities, and all other appurtenances and supplies necessary for **07-31, Chelan Pump Station – Pump Procurement, Schedule _____** in accordance with the Contract Documents and any Addenda thereto, for the total sum of \$_____ Dollars (U.S. Funds), which amount includes the cost of a 100% Performance and Payment Bond, said total Bid Price being based on the total of the prices shown on the attached Bid Price Schedule.

We agree that the price(s) as quoted in the Bid Price Schedule(s) are all-inclusive and include(s) all labor and material (except as stated in the Contract Documents for items to be furnished by the District), supplies, equipment, special tools, costs, insurance, permits, all taxes (exclusive of Washington State sales tax), overhead, temporary construction and temporary facilities, cleanup, profit, and all miscellaneous items for a complete Project as specified.

We agree that we are satisfied as to the nature and location of the Work, the general and local conditions, and all other matters which can in any way affect the Work, the time required to complete the Work, or the cost thereof under these Contract Documents. Additional compensation shall not be requested because of our failure to be fully informed of the conditions under which the Work shall be performed.

We agree to commence Work on or before a date to be specified in a written Notice to Proceed from the District and to strictly comply with the Contract Time schedule as specified in the Contract Documents.

The Work shall be Substantially Complete by March 31, 2008.

We agree to enter into a written Contract with the District in the form included in the Contract Documents. We agree to furnish the Performance and Payment Bond and Insurance Certificates as required by the Contract Documents within ten (10) days of our receipt of the written Notice of Award.

Receipt of Addenda Numbers _____, _____, _____, _____, is hereby acknowledged. Included herein are the originals of the executed Bid Proposal, Bid Price Schedule, Unit Price Schedule for Changed Work (if applicable), Noncollusion Affidavit of Prime Bidder, List of Proposed Subcontractors, Bidder's Data (if applicable), and Bid Bond, certified or cashier's check.



Section E
Contract Document Forms

Attached hereto is a certified, cashier's check or Bid Bond drawn in favor of Public Utility District No. 1 of Chelan County, Washington, this amount being not less than 5% of the Bid Price.

If submitting a certified or cashier's check, please identify number _____ and amount _____.

We agree that this Bid Proposal as submitted will remain in force for 40 days after the official opening of bids.

Dated: _____

Submitted by: _____

(Name of Bidder – typewritten or printed)

Per: _____

(Signature and Title)

Address: _____

(Business Address – typewritten or printed)

Telephone: _____

E-Mail: _____

Fax: _____

Contractor's License No.: _____

Contractor's State Registration No.: _____

Washington State Dept. of L&I Insurance Account No.: _____

The Bidder must state status of Company as: (Check correct box and fill in as appropriate.)

- ☐ Individual, d/b/a _____, or
☐ Partnership, names of partners _____, or
☐ Corporation of the State of _____, or
☐ Joint Venture _____.

4. UNIT PRICE SCHEDULE FOR CHANGED WORK (ALSO IN INSTRUCTIONS TO BIDDERS)

As specified in the Contract Documents, the District may order extra Work of the kind bid upon or make changes by altering, adding or deducting from the Work. The cost or credit for the Work shall be determined by the District, as specified in SECTION C, GENERAL CONDITIONS, CHANGES IN THE WORK. The following Unit Prices are hereby submitted by the Bidder for District approval. Bidder understands that the following Unit Prices shall be applicable for changed or extra Work only, if any, and may be rejected in whole or in part by the District. The following Unit Prices shall remain effective until final acceptance of the Contract by the District.

ITEM	AMOUNT
1.	\$ _____
2.	\$ _____
3.	\$ _____
4.	\$ _____
5.	\$ _____
6.	\$ _____

The foregoing Unit Prices shall include all labor, material and equipment costs and all other associated costs, including profit and overhead required to provide the item installed in place and functioning as part of the finished Project.

Submitted By: _____
(Name of Bidder – typewritten or printed)

Per: _____
(Signature and Title)

5. LIST OF SUBCONTRACTORS

Each Bidder shall, in accordance with SECTION B, BIDDING INSTRUCTIONS, SUBCONTRACTS, submit as a part of its bid, the names of all Subcontractors with whom the Bidder, if awarded the Contract, will subcontract for the performance of the Work designated on a list to be submitted with the bid. Failure of a Bidder to name such Subcontractors may render a Bidder's bid non-responsive and therefore void.

List hereunder the Work to be performed and the name, address and telephone number of the corresponding Subcontractor who will perform the Work. The District, as part of its evaluation of bids, will review each Subcontractor utilizing the bid evaluation criteria established herein for evaluating the Bidder.

These Bid Documents may list certain specialty types of work in which the District has a particular interest in evaluating the Subcontractor designated by the Bidder. Such a listing will not relieve the Bidder from listing all the Subcontractors.

Name/Address/Telephone/Fax/E-Mail
of Person/Firm Performing Work

Description of Work to be performed

PRIME CONTRACTOR:

SUBCONTRACTORS AND SUPPLIERS:

Pumps and Motors

Fish Screen System

Pre-Engineered Building

Motor Control Centers

Transformers

Automatic Transfer Switch

Electrical Control System Integrator

(Bidder shall attach additional sheets if necessary.)

6. NONCOLLUSION AFFIDAVIT OF PRIME BIDDER

STATE OF WASHINGTON)
) ss.
County of _____)

_____, being first duly sworn, deposes and says that:

1. I am the _____ of _____, the Bidder who has submitted the attached Bid Proposal;
2. I am fully informed respecting the preparation and contents of the attached Bid Proposal and all pertinent circumstances respecting such bid;
3. I am fully aware that the laws of the State of Washington, Chapter 9.18 RCW, make it a gross misdemeanor for any person for himself or herself or as an agent or officer of any other person, persons, or corporation to in any manner enter into collusion or an understanding with any other person, persons, or corporation to prevent or eliminate full and unrestricted competition upon any public work or improvement;
4. Such bid is genuine and is not a collusive or sham bid;
5. Neither Bidder nor any of its officers, partners, owners, agents, representatives, employees or parties in interest have 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 Proposal has been submitted or to refrain from bidding in connection with such Contract, or have in any manner, directly or indirectly, sought by agreement or collusion or communication or conference with any other Bidder, firm or person to fix the price of any other Bidder, or to secure through any advantage against the District or any person interested in the proposed Contract; and
6. The price or prices quoted in the attached Bid Proposal 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.

Signature: _____

By: _____

Title: _____

7. CONTRACTOR'S APPLICATION AND CERTIFICATE FOR PAYMENT

Project: 07-31, Chelan Tailrace Pump Station		For Period: _____	
Owner: P.U.D. No. 1 of Chelan County		District Purchase Order No: _____	
Engineer: _____			
Original Contract Amount: \$ _____			
Field Work Order/Change Order No.: _____ \$ _____			
Adjusted Contract Amount: \$ _____			
Detail	Previous Period	This Period	To Date
A. TOTALS			
B. Sales Tax on Applicable Items			
C. SUBTOTALS			
D. Less Retainage 5% on Item A			
Less Previous Payments			
NET			
AMOUNT DUE THIS ESTIMATE			

Section E

Contract Document Forms

Contractor warrants that:

- A. All persons, firms, corporations and other entities furnishing labor, employee benefits, materials, equipment and/or services in connection with the Project, at the request of and for or on behalf of Contractor, have been or will be paid in full through the entire period stated above from funds already received or to be received from this payment. Neither Contractor nor any person, firm, corporation, or other entity who has furnished labor, employee benefits, materials, equipment and/or services to Contractor for the Project has any claim or any right to file a claim or lien against the District or the retainage on the Project, except as follows: _____
- (none, unless otherwise stated).
- B. There are no federal, state, or municipal taxes, warrants, levies or other charges, unpaid or delinquent which constitute an encumbrance, claim or lien against the District or the retainage on the Project. No government agency has a claim nor the right to file a valid claim, warrant, lien, levy or other encumbrance against the District or the retainage on the Project, except as follows: _____
- (none, unless otherwise stated).
- C. The undersigned Contractor agrees to indemnify and hold the District harmless from any and all claims or liens which might be filed contrary to the warranties made above and to defend any such claims without any cost, expense or damage to the District.
- D. Except as expressly listed in paragraphs A and/or B above, the undersigned Contractor, in consideration for the payment amount shown above, hereby forever releases the District from any and all claims arising under or in connection with the Project during the period covered (with the exception of claims for retainage) and accepts the payment amount stated above as full compensation and consideration (except for retainage) for the work performed upon the Project which is the subject of this payment, including, but not limited to, any and all Field Work Orders/Change Orders, miscellaneous charges, extra work, delays, impacts, etc.
- E. This certification is made by the undersigned with a full understanding of the facts set forth herein, and for the purpose of inducing the District to make payment on the assurance that there are no liens, claims, or other encumbrances, except those described above, arising from the labor, materials, services and/or equipment furnished by Contractor, for the Project, which may be asserted in any way against the Project, the District, or the retainage on the Project.
- F. The person signing this document, regardless of whether he/she is signing in a representative capacity, specifically represents that he/she has reviewed the relevant records of Contractor, and has personal knowledge that the contents of this application and certificate for payment are complete, accurate and true. The undersigned also represents that he/she has been duly authorized to sign this certificate and to make the representations set forth above on behalf of the Contractor and any entity claiming through the Contractor.

The undersigned Contractor certifies and declares under penalty of perjury under the laws of the State of Washington that the above is complete, accurate and true and that there is due and payable to the Contractor the amount listed after "Amount Due This Estimate."

By: _____ (Contractor) Date: _____

8. CERTIFICATE AND RELEASE

(Final Payment)

FROM: _____ (Contractor)
TO: PUBLIC UTILITY DISTRICT NO. 1 OF CHELAN COUNTY (DISTRICT)
REFERENCE BID NO. _____ ENTERED INTO THE _____ DAY OF _____, 20____
BETWEEN THE DISTRICT AND THE CONTRACTOR of _____
(City, _____ State), _____ FOR _____ THE
LOCATED IN
CHELAN COUNTY and STATE OF WASHINGTON.

KNOW ALL MEN BY THESE PRESENTS:

1. The undersigned hereby certifies that there is due from and payable by the District to the Contractor under the Contract and duly approved Field Work Order/Change Order(s) the balance of \$ _____.

2. The undersigned further certifies that in addition to the amount set forth in paragraph 1, there are outstanding and unsettled the following items which the Contractor claims are just, due and owing by the District to the Contractor:

(Itemize claims and amounts due - attach additional pages if necessary.) (None, unless otherwise stated)

3. The undersigned further certifies that all Work required under this Contract, including Work required under Field Work Order/Change Order(s) numbered _____, has been performed in full compliance with the terms thereof; that all contractual conditions have been satisfied; that there exist no outstanding unpaid taxes owed by the Contractor to the State of Washington as a result of this Contract, and that there are no unpaid claims for materials, unpaid wages arising out of the performance of this Contract, and that the wage rates paid by the Contractor and all Subcontractors have fully conformed with the Contract provisions and state and federal laws and regulations relating to wage rates.

4. Except for the amounts stated under paragraphs 1 and 2 hereof, the undersigned has received from the District full and complete payment of all sums of money payable to the undersigned under or pursuant to the above mentioned Contract or any modification or change thereof.

5. In consideration of the payment of the amount stated in paragraph 1 hereof, the undersigned does hereby release the District from any and all claims arising under or by virtue of this Contract, except the amount(s) listed in paragraph 2 hereof; provided, however, that if for any reason the District does not pay in full the amount stated in paragraph 1 hereof, such deduction shall not affect the validity of this release, but the amount so deducted shall be automatically included under paragraph 2 as an amount which the Contractor has not released but will release upon payment thereof. The Contractor further certifies that upon the payment of the amount listed in paragraph 1

hereof, it shall release the District from any and all claims of any nature whatsoever arising out of the Contract or modification thereof and shall execute such further releases or assurances as the District may request.

6. This Certification and Release is in no way intended to, and shall not, operate to release and/or relieve Contractor and/or Contractor's successors, agents, and assigns from any past, present and/or future obligation, warranty or duty under the Contract and/or pursuant to statute and/or federal law.

Contractor represents the following relating to the hours worked by workers on this Project:

Total work hours for journeymen workers for each craft.

CRAFT	HOURS
CRAFT	HOURS
CRAFT	HOURS

Total work hours of apprentice workers for each craft.

CRAFT	HOURS
CRAFT	HOURS
CRAFT	HOURS

IN WITNESS WHEREOF, the undersigned has executed this instrument on behalf of the Contractor this ____ day of _____, 20____, and declares under penalty of perjury under the laws of the State of Washington that the matters stated herein are true, accurate and complete, and that it is fully authorized to act on behalf of the Contractor in this regard.

By: _____
(Contractor)

(Signature and Title)

10. INVENTORY LIST OF HAZARDOUS CHEMICALS

Prior to the issuance of the Notice to Proceed, the Contractor shall provide an inventory list and up to date, complete and legible copies of the Material Safety Data Sheets (MSDS) for all hazardous products to be used on District property as a part of this Contract (see SECTION C, GENERAL CONDITIONS, WORKER'S RIGHT TO KNOW).

[illegible]

(Contractor shall attach additional sheets if necessary.)

11. NOTICE OF AWARD

Date _____

VIA FAX (____) ____-____

Contractor Name _____

Contractor Address _____

Contractor City, State, Zip _____

Re: Notice of Award

Project Number, Project Name _____

The District has considered the Bid Proposal submitted by you for the above described Project in response to its Advertisement for Bid No. _____ dated _____, 20____. You are hereby notified that your Bid Proposal in the amount of \$ _____ has been accepted.

You may consider this Notice of Award as authorization to begin securing the Performance and Payment Bond and insurance required for this Project. The Performance and Payment Bond shall include Washington State sales tax. The Procurement & Contract Services Department is authorized to issue the Notice to Proceed following receipt and approval of all required documents.

Applicable forms must be filed as outlined in the Bid Document, originals of which will be forwarded to you under separate cover. As provided in the Contract Documents, you are required to execute the Contract, to furnish the required Performance and Payment Bond, and to provide insurance certificate(s) within ten (10) days from the date of delivery of this Notice of Award. Failure to do so will entitle the District to consider all your rights arising out of the District's acceptance of your Bid Proposal as abandoned and award the Work covered by your Bid Proposal to another, or to re-advertise the Work or otherwise dispose thereof as the District may see fit.

Please acknowledge receipt of this Notice of Award by signing below and returning it by fax to my attention at (509) 661-8113. Please also return the original signed fax copy by mail to my attention. If you have questions, please do not hesitate to contact me at (509) 661-____ or e-mail me at _____@chelanpud.org.

Respectfully, _____

Receipt of the above Notice of Award is hereby acknowledged and accepted. The individual executing this Notice of Award warrants he/she is fully authorized to bind his/her principal to the terms and conditions of this document.

CONTRACTOR NAME _____

Signature _____

Date _____

12. NOTICE TO PROCEED

TO: _____ DATE: _____

BID NO: _____ PROJECT NAME: _____

You are hereby notified to commence Work on the Project in accordance with the Contract dated _____, 20____ on _____, 20____, or as directed by the District, and you are to complete the Work on the Project within _____ consecutive calendar days thereafter. The date of Completion of all Work on the Project is therefore _____, 20____.

PUBLIC UTILITY DISTRICT NO. 1 OF
CHELAN COUNTY (DISTRICT)

BY: _____

TITLE: _____

Receipt of the above NOTICE TO PROCEED
is hereby acknowledged and accepted.

Signature: _____

Title: _____

Company: _____

Date: _____

13. PERFORMANCE AND PAYMENT BOND

Bond No. _____

KNOW ALL MEN BY THESE PRESENTS, that we _____
(hereinafter called the "Principal"), as Principal, and _____
(hereinafter called the "Surety"), as Surety, are jointly and severally held and bound
unto Public Utility District No. 1 of Chelan County, Washington, (hereinafter called
"Obligee") in the sum of Dollars (\$ _____), together with all sums reflected in Field Work
Order/Change Order(s) to this Contract, lawful money of the United States of America
for the payment of which we jointly and severally bind ourselves and our heirs,
executors, administrators, successors and assigns, firmly by these presents.

THE CONDITION OF THE ABOVE OBLIGATION IS SUCH that, whereas on the
_____ day of _____, 20____, the said Principal herein agreed to provide:
_____ under Bid Number
_____.

NOW, THEREFORE, if this Principal herein shall faithfully and truly observe, perform
and comply with all of the terms, conditions and provisions of the Contract, and shall
well and truly and fully do and perform all matters and things undertaken to be
performed under the Contract upon the terms thereof, and within the time prescribed
therein, and all guarantees and warranties arising thereunder, and shall pay all laborers,
mechanics, Subcontractors, materialmen and all persons who shall supply Principal or
such Subcontractors with provisions and supplies for the carrying on of such work and
shall in all respects faithfully perform said Contract according to law, then this obligation
shall be satisfied; otherwise the Bond shall remain in full force and effect.

No prepayment or delay in payment and no change, extension, addition or alteration of
any provision of said Contract agreed to between the Principal and the Obligee, and no
forbearance on the part of the Obligee shall operate to relieve the Surety from liability
on this Bond, and consent to make such change, extension, addition or alteration
without further notice to or consent of the Surety is hereby given.

This Bond is given in compliance with the laws of the State of Washington as contained
in Chapters 39.08 and 54.04, Revised Code of Washington, and all acts amendatory
thereto. No right of action shall accrue hereunder to or for the use of any person other
than Obligee, except such right of action as is given by the laws of the State of
Washington to persons performing labor upon or furnishing materials, or supplying
provisions and supplies for the carrying on of such work or the making of such
improvements.

The Surety agrees this Performance and Payment Bond shall be governed by the laws
of the State of Washington. The Surety submits to the exclusive jurisdiction of the



Section E
Contract Document Forms

courts and agrees to be bound by the laws in the State of Washington, USA. Venue for any action to enforce or interpret this Performance and Payment Bond shall be in Superior Court for Chelan County, Washington.

WITNESS OUR HANDS this ____ day of _____, 20__.

Address of Local Office and
Agent for Surety Company:

Agent Name _____

Agency Name _____

Street Address _____

Mailing Address _____

City/State/Zip _____

Telephone Number _____

Fax Number _____

E-mail address _____

PRINCIPAL

By _____

Signature

Printed Name _____

Title _____

SURETY

Name _____

Mailing Address _____

Street Address _____

City/State/Zip _____

By _____

Signature of Its Attorney in Fact

Printed Name _____

14. RETAINAGE INVESTMENT

Public Utility District No. 1 of Chelan County

Project No. _____ Contractor _____ Date _____

Pursuant to RCW 60.28.011, you have the option to have the monies reserved as retainage held by the District, or deposited in an interest bearing account at a bank, or placed in escrow at a bank or trust company and invested. Retainage funds shall be deposited with a public depository as approved by the State of Washington, Public Deposit Protection Commission. You may select which public depository should be used by the District. A listing of public depositories may be obtained through the Office of the State Treasurer, PO Box 40206, Olympia, WA 98504-0206, telephone (360-902-9000), home page <http://www.tre.wa.gov>. You are requested to complete and return this form as soon as possible. You may submit a bond in lieu of all or any portion of the retainage. The bond must be on the District approved bond form and from a bonding company meeting the standards the District has set, a copy of which standards may be obtained upon request from the District. The District reserves the right to refuse to accept such bond for good cause shown. Such bond shall be subject to all claims and liens and in the same manner and priority as applies to retained percentages.

Should you desire to have the retained monies placed in escrow and invested, please provide to the District's Accounts Payable Supervisor, P.O. Box 1231, Wenatchee, WA, 98807, the necessary forms for the completion of an escrow agreement with a bank or trust company and the District.

CONTRACTOR'S OPTION

- ☐ I request that the retainage be held by the District.
- ☐ I request that retainage be deposited by the District in an interest bearing account in a bank, mutual savings bank, or savings and loan association.
- ☐ I request that retainage be placed by the District in escrow with a bank or trust company.

Name of Public Depository for Deposit or Escrow

Address

City, State, Zip Code

Signature

Title

15. CONTRACT

THIS CONTRACT, made by and between PUBLIC UTILITY DISTRICT NO. 1 OF CHELAN COUNTY, WASHINGTON, (hereinafter "District") and _____ doing business as an individual/a partnership/a corporation/a limited liability corporation/a joint venture in the State of _____, (hereinafter "Contractor"), sometimes collectively referred to as the "Parties".

RECITALS

1. The District issued an Invitation for Bid No. _____ dated _____ and amended on _____;
2. Contractor submitted a Bid Proposal in response to the Invitation for Bid, dated _____;
3. The District and the Contractor have agreed that the terms and conditions of this Contract shall govern Contractor's furnishing to the District the _____.

AGREEMENT

In consideration of the mutual covenants and agreements of the parties herein contained and to be performed, the parties agree as follows:

1. The Contractor shall commence and complete the Work described as follows:

Bid No. _____
Insert Bid Title

hereinafter referred to as the Project, for the Contract Price of _____ Dollars (\$ _____) together with all additional or changed Work in connection therewith, under the terms as stated in the Contract Documents which are incorporated herein as though fully set forth as terms of this Contract; and at Contractor's cost and expense to furnish but not limited to all the materials, supplies, machinery, equipment, tools, Superintendence, labor, insurance, and other accessories and services necessary to complete said Project in accordance with the Specifications and conditions stated in the Contract Documents.

The Contractor shall commence Work on the Project on or before a date to be specified in a written Notice to Proceed by the District and to strictly comply with the Contract Time schedule.

2. The Contractor warrants to the District that it has the expertise and experience necessary to properly perform the Work in a timely manner and that its Proposal includes all of the functions and features necessary to properly perform and timely perform the Work pursuant to the Contract Documents.

3. The District agrees to pay the Contractor the Contract Price in accordance with the Contract Documents and otherwise perform the covenants and conditions required of the District set forth herein.

4. By executing this Contract the Contractor represents that the waiver of the Contractor's immunity under industrial insurance, Title 51 RCW, as set forth in the Contract Documents was mutually negotiated by the parties.

5. Contractor shall fully comply with all applicable federal, state and local laws, regulations and codes. The law of the State of Washington shall govern this Contract and all questions relating to it. The venue for any legal action involving the District related to this Contract shall be exclusively in the Chelan County Superior Court.

6. FURTHER TERMS, CONDITIONS AND COVENANTS of the Contract are set forth in the Contract Documents incorporated herein and by this reference made a part hereof, consisting of:

Section B	Bidding Instructions	Section G	Specifications
Section C	General Conditions	Section H	Contract Drawings
Section D	Supplemental Conditions	Addenda	
Section E	Contract Document Forms	Performance and Payment Bond	
Section F	Bidders Data (if applicable)		

Each of the individuals executing this Contract on behalf of the District and the Contractor warrant he/she is an authorized signatory of the entity for which he/she is signing, and have sufficient corporate authority to execute this Contract. The parties hereto have executed this Contract with an Effective Date of _____, 20____.

PUBLIC UTILITY DISTRICT NO. 1
OF CHELAN COUNTY

CONTRACTOR

By: _____
Printed Name: _____

By: _____
Printed Name: _____

TITLE: _____

TITLE _____

ATTEST*: _____

ATTEST*: _____

***IMPORTANT:** Secretary of the District should attest. If Contractor is corporation, Secretary should attest. Give proper title of each person executing Contract.

16. FIELD WORK ORDER/CHANGE ORDER

PROJECT: Insert Project Name
FIELD WORK ORDER/CHANGE ORDER NO.: Insert No.
MAXIMO NO.: VENDOR CONTRACT/PURCHASE ORDER NO.:
CONTRACT NO.:

TO: Insert Contractor Name
SUBJECT: Insert brief description of change
EFFECTIVE DATE: Insert Effective Date

Contractor is directed to comply with the following changes to Contract No. _____.

DESCRIPTION OF WORK

Enter detailed description of change.

CONTRACT PRICE ADJUSTMENT

The total Contract Price exclusive of Washington State sales tax, shall be adjusted by \$ _____
enter amount to \$ _____ enter adjusted total contract amount.

TIME OF COMPLETION

The time for completion of the Work shall/shall not be adjusted by insert # of days
calendar days.

LEGAL EFFECT

The Contract is hereby modified to include the changes specified herein and this Field Work Order/Change Order (FWO/CO) is hereby made as a part of the Contract. The Work shall be performed and completed in strict compliance with the Contract Documents. The payments as specified herein shall constitute full compensation for furnishing all labor, materials, tools, equipment and incidentals as required to complete the Work.

The Contract Price adjustment and time extension (if required) in accordance to this Field Work Order/Change Order and pursuant to the Contract, as modified, shall also be in full payment and satisfaction of any rights or claims of the Contractor with respect to additional compensation, schedule adjustments due to specific or overall impacts including acceleration, inefficiencies, and schedule recovery, harm, damages, losses, costs, overhead, profit or expenses of the Contractor (including but not limited to the Subcontractors, suppliers, laborers and materialmen of any tier) arising out of or due to

any change or delay of the Work resulting directly or indirectly from this Field Work Order/Change Order.

This Field Work Order/Change Order will supplement and amend the Contract only insofar as specifically provided herein. All provisions of the Contract will apply hereto and, except as expressly provided herein, all other terms and conditions of the Contract shall remain unchanged and in full force and effect.

IN WITNESS WHEREOF, the District hereby directs the Contractor to comply with the changes to the Contract as of the effective date. If executed by Contractor, the Contractor acknowledges, approves and accepts the terms and conditions of this Contract change as of the effective date. The undersigned warrants that he/she has the authority to execute this document and to bind his/her principal in accordance with the Contract Documents, Section C, General Conditions, Project Site Management and Safety and Contractor's Superintendence.

**Field Work Order/Change Order
Acknowledged, Approved and
Accepted:**

**PUBLIC UTILITY DISTRICT NO. 1 OF
CHELAN COUNTY, WASHINGTON**

Contractor:**

Insert Contractor's name

By: _____
Contractor's Superintendent
or Other Authorized Signator

Date: _____

**A mutual signed agreement is encouraged; however, the signature of the Contractor is not required for a directive pursuant to Section C, General Conditions, Definitions.

By: _____
Initiator

Date: _____

By: _____
Project Manager

Date: _____

By: _____
Department Director*

Date: _____

By: _____
Assistant General Manager

Date: _____

By: _____
General Manager*

Date: _____

*If necessary, pursuant to Resolution 03-12406.

*If necessary, pursuant to Resolution 03-12406.

SECTION F

BIDDER'S DATA

Provide the following Bidder's Data for Schedules A, B, and C with bid proposal. Clearly label information with related Bid Schedule.

1. Bidder shall provide with its bid, a list of ten (10) projects of similar scope that confirms the Bidder's qualifications. Provided info for each shall include:
 - Scope of Contractor's responsibility
 - Description of items designed, manufactured and installed including dates.
 - Customer contact name, phone number, and email address
 - Dollar value of work.
 - Time to complete shop work and field work (days).
 - Two general arrangement drawings showing the pump system and cleaning equipment layout front and side elevations or two photographs.
2. Bidder shall provide with its bid preliminary outline dimensions and data for the proposed equipment including:

Pumps and Motors

- Performance curve for the proposed pumps, including:
 - a. Variable Speed Curves in 10 percent increments from 100 percent to minimum allowed operating speed
 - b. Flow – Identify flow at design points and minimum and maximum flows for each variable speed curve

Tailrace WSEL (ft)	Flow (cfs)	Head (ft)	Pump Efficiency (%)	Power Consumption (kW)
706.1				
707.7				
709.5				

- c. Pump Model No.
- d. Propeller Diameter
- e. Rotational Speed
- f. Pump Weight
- g. Pump Assembly Weight Including Motor
- h. Minimum Submergence
- i. Brake Horsepower Required
- j. NPSHr
- k. Motor Voltage
- l. Motor Rating (hp)

- Drawings of the pump and motor cross section showing all components and materials of construction.
- For any item marked on the Drawings with an asterisk, provide confirmation of that dimension or provide a detail showing the suggested change and/or reconfiguration of that item.
- Outline drawings and dimensions of the pumps and motors, including:
 - a. main outline dimensions of the pump and motor
 - b. electrical cable connections
 - c. electrical schematic diagrams
- Drawings and dimensions of the pump structure materials, as appropriate, including:
 - a. Pump attachment flanges
 - b. Pump cans
 - c. Pump suction inlet piping
 - d. Pump guides
- Operation and maintenance requirements including frequency of inspections and preventive maintenance requirements.

Fish Screen System

- Drawings of the fish screen system showing all components and materials of construction.
- For any item marked on the Drawings with an asterisk, provide confirmation of that dimension or provide a detail showing the suggested change and/or reconfiguration of that item.
- Additional information, including the following:
 - a. Screen material type, ASTM classification, including coatings
 - b. Weight of each T-screen assembly
 - c. Flange type and bolt drilling pattern
 - d. Compressor type and capacity
 - e. Motor size and dimensions
 - f. Receiver size and dimensions
 - g. Cleaning system pipe, valve, and actuator size and dimensions
- Operation and maintenance requirements including frequency of inspections and preventive maintenance requirements.

Equipment Building

- Outline drawing of the Equipment building, including elevation, plan, and side views, anchoring details, finishes, and approximate weight including equipment.
- Structural specifications for the Equipment building
- Proposed internal equipment layout

- Outline drawings for the MCC equipment including: elevation, plan and side views, component layout and identification, and conduit entries for each section.
- MCC one-line diagram, if modified from Bid package drawings
- Manufacturer's make and model number for all MCC equipment and components

Electrical Equipment

Oil-Filled Pad-Mounted Transformer

- Outline drawings of components including transformer showing core and conductor materials and high voltage fused disconnect
- Concrete pad thickness requirements for seismic anchorage, including anchor bolt type, layout and embedment depths.
- Transformer
 - a. Rating (MVA) _____
 - b. High Voltage (kV) _____
 - c. Low Voltage (V) _____
 - d. Winding Connections (HV-LV) _____
 - e. Insulation Level (BIL) _____
 - f. Percent Impedance (%) _____
 - g. Cooling Classification _____
 - h. No Load Losses (kW, guaranteed) _____
 - i. Load Losses at 100%, 75%, and 50% Load (kW) _____
 - j. Auxiliary Power Requirements (V and kW) _____
 - k. Weight with Oil (lbs.) _____
 - l. Tap changer range _____
 - m. Bushing Data _____
 - n. Surge Arrestor Data _____
 - o. Insulating Oil _____
 - p. Manufacturer and Model Number _____
- High Voltage Fused Disconnect
 - a. Insulation Level (BIL) _____
 - b. Fuse Rating and Data _____
 - c. Manufacturer and Model Number _____
- Low Voltage (480 V) Main Circuit Breaker
 - a. Voltage Rating _____
 - b. Insulation Level _____
 - c. Continuous Current (A) _____
 - d. Interrupting Rate (3-phase MVA) _____
 - e. Manufacturer and Model Number _____

Pump Control Panel

- Manufacturer's make and model numbers of major equipment including field sensors, PLC, and operator interface.

END OF SECTION F

SECTION G

TECHNICAL SPECIFICATIONS

TABLE OF CONTENTS

DIVISION 1	GENERAL REQUIREMENTS
01010	SUMMARY OF WORK
01300	ADMINISTRATIVE REQUIREMENTS
01311	COORDINATION AND MEETINGS
01330	INSTRUCTIONS AND MANUALS
01420	REFERENCES - CODES AND STANDARDS
01450	CONTRACTOR QUALITY CONTROL
01460	INSPECTIONS AND TESTS
01611	SEISMIC ANCHORAGE AND BRACING
01660	SPECIAL SERVICES
01661	OPERATIONAL ACCEPTANCE TESTING
01700	PACKAGING, SHIPPING, DELIVERY, AND STORAGE
01760	SPARE PARTS AND MAINTENANCE MATERIALS
DIVISION 5	METALS
05050	WELDING
05500	METAL FABRICATIONS AND CASTINGS
DIVISION 9	FINISHES
09902	PAINTING
DIVISION 11	EQUIPMENT
11215	VERTICAL PUMPS

11305 SUBMERSIBLE MOTOR-DRIVEN PUMPS

DIVISION 13 SPECIAL CONSTRUCTION

13020 FISH SCREENING SYSTEM

13121 PREFABRICATED BUILDINGS

DIVISION 16 ELECTRICAL

16010 BASIC ELECTRICAL REQUIREMENTS

16220 LOW-VOLTAGE AC INDUCTION MOTORS

16260 LOW-VOLTAGE VARIABLE FREQUENCY DRIVE SYSTEM

16270 OIL-FILLED PAD MOUNTED TRANSFORMERS

16288 TRANSIENT VOLTAGE SUPPRESSION

16412 AUTOMATIC TRANSFER SWITCHES

16480 MOTOR CONTROL CENTERS

16700 PUMP CONTROL PANEL

END OF SECTION G TOC

SECTION 01010

SUMMARY OF WORK

TABLE OF CONTENTS

1.0	PROJECT DESCRIPTION.....	2
1.1	BACKGROUND	2
1.2	PUMPING PLANT OPERATION	2
1.3	POWER SYSTEM INTERFACE AND CONTROLS	3
2.0	DESCRIPTION OF WORK	3

SECTION 01010

SUMMARY OF WORK

1.0 PROJECT DESCRIPTION

1.1 BACKGROUND

Public Utility District No. 1 of Chelan County (District) owns and operates the Chelan Hydroelectric Project, which is located at the confluence of the Chelan and Columbia Rivers approximately forty (40) miles north of Wenatchee, Washington. In accordance with the FERC License Order for the Chelan Hydroelectric Project, the District will construct the Chelan Tailrace Pump Station Project between the tailrace of the Chelan Powerhouse and the upstream end of Reach 4 of the Chelan River. The project includes a fish screen intake, pump station, 1,000 feet of lined canal and an outlet structure. The proposed pump station will have an installed capacity of 260 cfs and will provide flow to the Reach 4 area of the lower Chelan River to enhance steelhead and Chinook salmon spawning habitat. The project must be constructed and operational by November 6, 2008.

To meet this schedule and to select the most economical pump configuration these contract documents were prepared to solicit proposals from experienced and qualified pump manufacturers to pre-purchase equipment for the project. A general construction contract for the project will be advertised later in early 2008.

The Work included in this Contract includes the design, manufacturer, factory testing, shipping, field testing and start up services for the following equipment systems:

- Intake tee screens with air backwash system.
- Electric motor driven pumps.
- Associated electrical equipment.
- Prefabricated equipment building
- Pump control panel

All equipment delivered under this contract will be installed by a General Contractor (Installation Contractor) under a future contract with the District.

1.2 PUMPING PLANT OPERATION

Operation will normally be unattended, under automatic flow control, and will deliver 260 cfs at the low design tailrace water elevation. The pump station shall deliver no more than 260 cfs and no less than 26 cfs and any flow in between over the full range of

heads. It is anticipated that the pump station will operate continuously each year at 240 cfs from March 15 to May 15 and October 15 to November 30. It will be shut down during the rest of the year but needs to be on stand by to supply water throughout the year.

1.3 POWER SYSTEM INTERFACE AND CONTROLS

Power will be provided through a 750 KVA pad mounted liquid filled transformer. The connection point shall be as shown on the Contract Drawings. Control of the system will be provided by a pump station control system. The control system shall be based upon the use of a programmable logic controller (PLC), with all control and status data available to the operator through a control panel mounted graphical operator interface unit.

2.0 DESCRIPTION OF WORK

Furnish all labor, materials, and equipment required for the design, manufacture, supply and delivery of the equipment as detailed in the Contract Documents, including:

- Intake tee screens with air backwash system.
- Electric motor driven pumps.
- Associated electrical equipment.
- Prefabricated equipment building.
- Pump control panel.
- Testing.

The Contractor shall provide, for Engineer's review and evaluation, proposed modifications to equipment layouts and electrical equipment configurations and ratings, which are required to suit Contractor's proposed equipment. All proposed changes must not alter the number or flow capacity of pumps to be furnished or violate the mandatory dimensions shown on the Contract Drawings.

The Contract Drawings issued with these Specifications are not to be considered as defining the design of the equipment to be furnished, but are intended only to be illustrative of the Specifications and to show the general layout of the equipment, except where limiting or mandatory dimensions and elevations are indicated. Modifications of the pump station design will be made, as necessary to suit the design of the equipment furnished by the Contractor.

All proportioning and detailing of the equipment to be furnished shall be done by the Contractor in accordance with the specified standards. Shop drawings, and data submitted by the Contractor and reviewed by the Engineer shall be considered as supplementary to the Contract Documents.

Furnish installation procedures.

Furnish testing procedures.

Supervise installation and testing of the equipment and systems detailed in the Contract Documents.

Furnish complete operations and maintenance manuals for all the equipment and systems detailed in the Contract Documents.

END OF SECTION 01010

SECTION 01300

ADMINISTRATIVE REQUIREMENTS

TABLE OF CONTENTS

1.0	GENERAL	2
2.0	SUBMITTAL SCHEDULE.....	2
2.1	FIRST SUBMITTAL	2
2.2	SECOND SUBMITTAL	3
2.3	THIRD SUBMITTAL	3
2.4	FOURTH SUBMITTAL	3
3.0	PROJECT CORRESPONDENCE	3
3.1	SERIALIZED LETTERS	4
3.2	SERIALIZED SPEEDY MEMOS	5
3.3	TELEPHONE AND PERSONAL CONTACT RECORDS.....	5
3.4	E-MAIL COMMUNICATIONS.....	5
3.5	SERIALIZED CONTRACTOR SUBMITTALS	6
3.6	DISTRICT SUBMITTAL RESPONSE	6
3.7	SERIALIZED CORRESPONDENCE NUMBERING (SMART NUMBERING)	7
3.8	ADDRESS INFORMATION	8
4.0	SUBMITTALS.....	8
4.1	GENERAL	8
4.2	DOCUMENTS AND DRAWINGS	10
4.3	DISTRICT'S REVIEW.....	10
4.4	OWNERSHIP	11
4.5	LANGUAGE	11
4.6	FORMAT	11
4.7	DRAWINGS	12
4.8	CALCULATIONS	15
5.0	PROJECT SCHEDULES	15
5.1	GENERAL	15
5.2	COMBINED PROJECT AND PRODUCTION SCHEDULE AND PROGRESS CHART	15
6.0	CONTRACT CLOSE-OUT SUBMITTALS.....	16
6.1	RECORD DRAWINGS.....	16
6.2	RECORD DOCUMENTS	16
7.0	LIST OF APPENDICES	17
7.1	SAMPLE: CONTRACTOR SUBMITTAL AND DISTRICT REPLY FORM.....	18
7.2	SAMPLE: SPEEDY MEMO	19
7.3	SAMPLE: RECORD OF CONVERSATION	20
7.4	SAMPLE: SHOWING HOW TO PROPERLY IDENTIFY EMBEDDED DOCUMENTS, CATALOG CUT SHEETS, ETC.	21

SECTION 01300

ADMINISTRATIVE REQUIREMENTS

1.0 GENERAL

This section describes the requirements and procedures for all correspondence, document and Drawing submittals to the District, Engineer and all parties involved with the Contract. The District reserves the right to revise or modify these procedures as necessary to facilitate proper and consistent communication between related parties.

This section provides examples of forms to be used by the Contractor in the Appendices. Alternate forms may be used subject to approval by the District's Engineer.

2.0 SUBMITTAL SCHEDULE

The Contractor shall complete the following designated portions of the Work called for under the Contract in all parts and requirements by the dates set forth or as extended in accordance with the Contract. Refer to technical specification sections for expanded list of submittals required.

2.1 FIRST SUBMITTAL

Submittal of equipment outline drawings in sufficient detail and dimensioned to permit pump station design to be completed and the Quality Control Plan, including but not limited to:

1. Pump outlines.
2. Fish screen outlines.
3. Motor control center equipment outlines.
4. Anchor bolt and grouting drawings.
5. Pump and motor weight, torque, and gravity load diagram.
6. Preliminary electrical schematics and control sequences.
7. Equipment building outline and general configuration including elevations, plan and sections.
8. Secondary unit substation outlines.
9. Embedded conduit plans.
10. Weights of all equipment to be supplied under this Contract.
11. Contractor Quality Control Plan with Shop Inspection and Test Plan.
12. Pump speed and frequency data.

2.2 SECOND SUBMITTAL

Submittal of detailed assembly drawings, device lists, final electrical and control schematics, including, but not limited to:

1. Motor electrical characteristics and other required data.
2. Equipment Electrical Requirements:
 - a. 480V, three-phase, 60 Hz.
 - b. 240/120V, single-phase, 60 Hz.
3. Paint system product data and quality control submittal.
4. Pump assembly drawings and data.
5. Fish screen assembly drawings and data.
6. Transformer assembly drawings.
7. Electrical schematics and control sequences.
8. MCC layout and assembly drawings.
9. Equipment building plan, power and light, elevations, and foundation drawings including anchorage requirements.
10. Pump control system schematics, screen layouts, and materials.
11. Outline of installation and testing procedures.
12. Outline of operation and maintenance manuals.

2.3 THIRD SUBMITTAL

Balance of drawings and data, including but not limited to:

1. All wiring diagrams and point-to-point interconnection drawings.
2. Pump curves.
3. Factory test procedures.
4. Complete installation and startup procedures.
5. Complete field testing procedures.
6. Acceptance Test Plan.
7. Draft operation and maintenance manuals.

2.4 FOURTH SUBMITTAL

Record Documents incorporating all as-built and field changes, revised operating and maintenance manual and factory test reports.

3.0 PROJECT CORRESPONDENCE

Correspondence between the Contractor and the District will be handled through the District's document management web site, also known as cpudprojects web site (found on the internet at www.cpodprojects.org). All correspondence (as listed in this section) will be posted to the web site. The web site utilizes Microsoft® Internet Explorer (which is

required). The following are highly recommended for efficient correspondence processing:

1. A high speed internet connection;
2. Document scanning capability;
3. Adobe® Acrobat 7 for PDF (*.pdf) files
(<http://www.adobe.com/products/acrobat/readermain.html>);
4. Autodesk® DWF Viewer™ 7 for DWF (*.dwf) files,
(<http://www.autodesk.com/sitesselect.htm>,
select country and proceed with downloading of: "Autodesk DWF Viewer It's Free" button).

Acceptable file formats are as listed in Submittals, Format, Electronic File Format, of this Section.

The District will provide hands-on web site training at District Headquarters after Contract award. A training manual will also be provided. Each Contractor employee requesting web site access must be approved by the District's Security Director. Once approved, the user will be assigned a user name and password by the cpudprojects web site administrator.

The cpudprojects web site utilizes a specific "Smart Number" file naming convention described further in Serialized Correspondence Numbering (Smart Numbering) (see this Section).

The following Project correspondence will be utilized for the duration of the Contract:

1. Serialized Letters
2. Serialized Speedy Memos
3. Records of Conversation (telephone and personal contacts)
4. Emails
5. Serialized Contractor Submittals
6. District Submittal Responses

3.1 SERIALIZED LETTERS

Serialized letters shall be used for all correspondence from any Project entity that addresses **Contract scope, budget, schedule, or other contractual issues**.

Serialized letters shall be posted to the cpudprojects web site and followed immediately by the signed original via regular or express mail, by courier service, or hand carried to the District.

If the District determines that there is any change to the Contract scope, budget, or schedule, then the District will issue a Field Work Order/Change Order (FWO/CO).

All Serial Letters shall include (on the first page):

1. Contract Number: 07-31, Chelan Tailrace Pump Station – Pump Procurement
2. Sender's Name
3. Sender's Company Name
4. Date: MM/DD/YYYY
5. Serial Letter Number

Additionally, each page shall indicate page number and total number of pages, formatted as "Page X of Y", and Serial Letter Number.

3.2 SERIALIZED SPEEDY MEMOS

Speedy Memos (Section G-01300 Appendix 6.3) shall be used for **requesting information, clarifications, or interpretations of the Contract**. Speedy Memos may be initiated by Contractor, District, or Engineer.

It is Contractor's responsibility to initiate a Serialized Letter identifying any contractual changes that may result from a Speedy Memo response.

Speedy Memos shall be posted to the cpudprojects web site. No hard copy is required.

3.3 TELEPHONE AND PERSONAL CONTACT RECORDS

Telephone and personal contact discussions (except meeting minutes) and particularly those which could result in a change to scope, schedule or budget, shall be recorded by the Contractor on a Record of Conversation Form (Section 01300 Appendix 6.4). Completed Record of Conversation Forms shall be posted to the cpudprojects web site within 3 calendar of the conversation.

3.4 E-MAIL COMMUNICATIONS

Parties to the Project may use e-mail for items other than those identified in the list of Project correspondence.

E-mail shall not be used for official correspondence as direction to proceed or to alter terms of the Contract.

E-mail may be used as a mechanism to transmit courtesy copies of other documents. Each e-mail shall contain a single subject. In rare cases similar subjects may be combined in a single e-mail if necessary for understanding. The Subject Line shall reference the:

1. Contract Number: **07-31**,
2. Project Name: **Chelan Tailrace Pump Station – Pump Procurement**, and
3. The email contents, clearly described.

3.5 SERIALIZED CONTRACTOR SUBMITTALS

The Contractor Submittal & District Reply Form (Section 01300 - Appendix 6.2) shall be used as the cover sheet for all Contractor submittals. Contractor shall post the cover sheet and attachments combined as one (1) document to the cpudprojects web site, followed immediately by one (1) signed original with attachments via regular or express mail, by courier service, or hand carried to the District. Documents shall be **CHECKED** by Contractor before being submitted. All drawings shall be stamped by Contractor as having been checked, including the name or initials of the person checking the drawings and the date.

If documents are changed subsequent to the original submittal, Contractor shall post the revised document(s) in accordance with the naming convention, to the cpudprojects web site for information or review and approval consistent with the original requirement.

Resubmittals shall have the same number and title as the original submittal with a numeric revision code (example: 07-31-XXXX-S-0001-1) added to the submittal cover sheet and file name until submittal is approved with no further action required.

New submittals shall not be combined with resubmittals.

3.6 DISTRICT SUBMITTAL RESPONSE

The Engineer will respond to submittals within two (2) calendar weeks after posting to the cpudprojects web site.

Engineer will mark Submittal Status with one of the following:

- ANR** – Approval Not Required
- APP** – Approved
- AAR** – Approved as Revised
- NOT APP** – Not Approved

Engineer will mark action required by the Contractor with one (1) of the following:

- NR** – No Action Required
- REV** – Revise and Resubmit for Approval
- RSR** – Revise and Submit for Record
- SR** – Submit for Record (As-built, O&M Manual, QA/QC Dossier)

SUBMITTAL STATUS	DESCRIPTION
Approval Not Required	Applicable to documents submitted for information only.
Approved	Document is approved for use.
Approved As Revised	Document is approved for use with incorporation and resolution of comments.
Not Approved	Document is not approved for use.

ACTION REQUIRED	DESCRIPTION
No Action Required	No action on the part of Contractor is required.
Revise and Resubmit for Approval	Contractor shall revise, take required action and incorporate comments, if any and repost the document addressing all comments within two (2) weeks of the District's posted response.
Revise and Resubmit for Record	Contractor shall revise and resubmit the document as part of the Final Record Documents.
Submit for Record (As-built, O&M Manual, QA/QC Dossier)	Contractor shall resubmit the document as part of the Final Record Documents.

Any work undertaken by the Contractor prior to submittal approval shall be at the Contractor's sole risk.

3.7 SERIALIZED CORRESPONDENCE NUMBERING (SMART NUMBERING)

Serial numbers shall begin at 0001 for each type of correspondence from each sender. Numbers shall be consecutive. Correspondence initiated by Subcontractors shall be routed and tracked through the Contractor. The Engineer shall approve all deviations to this requirement. If a deviation is agreed to in writing, then Subcontractors shall be bound by the same requirements as the Contractor, as provided herein.

Correspondence Smart Numbers and file names for this Project shall be formatted as follows:

DOCUMENT TYPE	NUMBERING CONVENTION AND FILE NAME
Serial Letters	07-31-XXXX-L0001-0
Speedy Memos	07-31-XXXX-M0001-0
Submittals	07-31-XXXX-S0001-0
Examples: 07-31-HHI-L0001-0	
07-31:	(Bid Number)
HHI:	(Contractor Designation, e.g. Hyundai Heavy Industries)
L0001:	(Correspondence Type and sequential number)
0:	(Revision number)
L0001-0	Letter Number 0001, Revision 0;

M0009-C1	Speedy Memo number 9, revision C1 (Revisions are with alpha characters (0, A, B, C...) If a Memo needs to be revised prior to a response, then use sequential numbering, following that revision alpha character.
S0054-3	Submittal Number 54, Revision 3 (Revision with sequential numeric character (0,1, 2, 3....)

The District will assign Contractor Codes for all parties involved.

3.8 ADDRESS INFORMATION

All Project correspondence shall be addressed as follows:

US Mail:

Chelan Tailrace Pump Station: Project Manager
ATTN: Mr. Gene Yow
P.U.D. No. 1 of Chelan County
P.O. Box 1231
Wenatchee, WA 98807-1231

Physical Address, (Fed Ex, UPS, oversized mail):

Chelan Tailrace Pump Station: Project Manager
ATTN: Mr. Gene Yow
P.U.D. No. 1 of Chelan County
327 N. Wenatchee Ave.
Wenatchee, WA. 98801

4.0 SUBMITTALS

4.1 GENERAL

The required submittals are not limited to those on the List of Required Submittals (Section 01300). The District or Engineer may, at any time throughout the duration of the Contract, require the Contractor to provide additional information pertaining to the Work. The Contractor shall comply by providing the information in the form of a Submittal.

Documents and Shop drawings shall be posted to the cpudprojects web site for information, or review and approval. Contractor shall supply complete documentation and shop drawings for the equipment provided in accordance with the format and procedures established by these Contract Documents.

Non-paper submittal items such as hardware, samples, material items, etc. that can not be posted to the District's cpudprojects web site shall be sent to the Project Manager along with a signed Contractor Submittal/District Reply cover sheet (see Section 01300).

Documents shall be submitted in a timely manner to support Contractor's engineering, design, and fabrication process. All delays due to untimely submittal of documents to District shall be the responsibility of the Contractor. Contractor shall arrange the submittal schedule such that no more than twenty-five (25) documents or shop drawings are posted per week, except as otherwise approved in writing (in advance), by the Engineer, or in the case of As-Built Drawings.

The Contractor shall furnish descriptions and drawings of the equipment he proposes to furnish, showing the dimensions of all parts, the materials from which the parts are to be made, the general arrangement and cross-sectional assembly, critical tolerances, and an outline drawing of each assembly, of equipment to be supplied, showing thereon the overall dimensions, limiting space requirements, and foundation requirements, in accordance with the submittal schedule.

The Contractor shall provide equipment documentation and shop drawings with overall dimensions and interfaces with other equipment in sufficient detail for the District's Engineer to review with the intent of verifying the Work is being performed in accordance with these Specifications and to complete the design of the pump station structural, civil, and mechanical components not included in this contract. Where both design calculations and drawings are prepared, they shall be posted together to allow complete review.

Materials shall be identified with the corresponding code or serial numbers referring to the standards of ASTM or to other standards recognized in the United States of America.

Contractor shall be responsible for the accuracy and correctness of dimensions and details on the documents and shop drawings. The approval of such documents and shop drawings by the Engineer shall not relieve Contractor of this responsibility.

Any document required by this Specification which is produced by a sub-supplier, or subcontractor shall first be **REVIEWED** and noted as being **APPROVED** by Contractor and then submitted to the Engineer for review and approval.

Contractor shall assume all responsibility and risk for conditions due to any error on shop drawings regardless of drawing approval or field acceptance of material or delivery.

Any fabrication or other Work performed in advance of Contractor's receipt of review comments and approval shall be entirely at Contractor's risk. After review, Contractor

shall not deviate in any way from the design, details, dimensions, or other information shown on the Drawings without the written approval of Engineer.

4.2 DOCUMENTS AND DRAWINGS

Documents and Drawings submitted by the Contractor, as a minimum, refer to information specifically required in the Submittal Schedule and elsewhere in this Specification. This information shall include all Drawings, diagrams, illustrations, manufacturer's product data, catalog data, brochures, performance charts and other information required to illustrate distinct portions of work.

Documents and Drawings shall include all the details necessary for fabrication, assembly, installation, repair, and maintenance of furnished items. The minimum drawings required are specified in individual sections of the Technical Specifications. Contractor shall furnish detailed fabrication drawings (shop drawings) and procedures for installation and assembly of all items provided.

If standard Drawings or catalog cut sheets are submitted, the applicable items and devices furnished shall be clearly marked, e.g., arrows pointing to text, text highlighted, and/or items enclosed with boxes, separating the intended item from others on the page (see Section 01300).

4.3 DISTRICT'S REVIEW

The purpose for requiring Contractor submittals is to permit the District's Engineer to monitor the Contractor's progress and to determine conformance with the intent of these Specifications.

Contractors and Subcontractors who use unapproved documents do so at their own risk and may be required to repeat activities that were performed if the document used is subsequently rejected by Engineer.

Submittals reviewed by the Engineer do not become Contract Documents and are not Change Orders.

Engineer review, acceptance, or approval of schedules, shop drawings, lists of materials, and procedures submitted or requested by the Contractor shall not add to the Contract amount and additional costs shall be solely the obligation of the Contractor.

The District will not be precluded, by virtue of review, acceptance, or approval, from obtaining a credit for fabrication and/or construction savings resulting from allowed concessions in the Work or materials provided. Any savings shall be mutually agreed upon by the Engineer and the Contractor.

The Engineer's review of Contractor submittals is not intended to be a rigorous engineering analysis of the Contractor's design or proposal. Engineer reserves the right

to require the Contractor to make changes to Contractor's submittals, which may be necessary, in their opinion, to make the Work conform to the provisions and intent of these Specifications. Any additional cost to correct a submittal, including work to maintain the schedule that may result from any delay to review a resubmittal, shall be solely the obligation of the Contractor.

The District will not be responsible for furnishing engineering or other services to protect the Contractor from additional costs accruing from submittals.

4.4 OWNERSHIP

All documents (i.e., shop drawings, data, manuals, calculations, schedules, etc., as well as plans and procedures for installation or testing) shall become the property of the District. The District shall have full rights to reproduce and submit to others any document for bids on future projects, notwithstanding any indication otherwise on the Drawing or elsewhere.

4.5 LANGUAGE

All documents (i.e. shop drawings, data, manuals, plans, procedures, calculations, schedules, digital photographs, etc.) submitted to the Engineer shall be in the English language. Dual language is acceptable on Drawings, provided all information is also provided in English. All numeric data shall use foot-pound-second system of units of measurements. All elevations shall be dimensioned in feet.

4.6 FORMAT

4.6.1 Electronic File Format

The following list of software and file formats shall be used for all submitted documentation or as approved by the Engineer.

SOFTWARE	FILE FORMAT	USAGE EXAMPLES
MathCAD®	MCD (*.mcd)	Engineering calculations
Microsoft® Word	DOC (*.doc)	Text files, forms
Microsoft® Excel	XLS (*.xls)	Spreadsheets, forms, calculations
Microsoft® Access	MDB (*.mdb)	Databases
Adobe®	PDF (*.pdf)	Text, pictures, reports, manuals, calculations
Audio editing	WAV (*.wav)	Audio files
Autodesk® AutoCAD®	DWG (*.dwg) 2000	Shop drawings
Autodesk® DWF Viewer™	DWF (*.dwf)	Shop drawings

All software used shall be the latest version or as approved by the Engineer. The only exception is for Autodesk® AutoCAD®, which shall be version 2000 (or earlier)

4.7 DRAWINGS

Project drawings include the following:

1. Shop Drawings (all drawings provided by Contractor or Subcontractor, as required by Contract);
2. Reference Drawings (as provided by District with Bid or at Contractors request – all dimensions and locations of existing equipment shall be field verified, as necessary, by Contractor). These Reference Drawings may be hard copy or electronic or both.

ALL Drawings prepared by Contractor or Subcontractor shall be in compliance with the following sections.

4.7.1 Reference Drawings (Existing Drawings)

Any existing Drawing (electronic or hard copy) requested by the Contractor will be scanned (if necessary) and sent via email or CD via mail, with a CD copy going to the Project Manager.

The Contractor shall make all changes to these Drawings adhering to the following conventions:

1. Color **RED** - any additions.
2. Color **GREEN** - any deletions.
3. Color **BLUE** - general notes to explain changes. (NOTE: these general notes will not be added to the final Drawing.)

Approved District Format: Electronic file format shall be as described in Electronic File Format, above. The District's preference is to receive DWG (*.dwg) files, but DXF (*.dxf) or TIF (*.tif) files may be accepted with the District's prior approval.

Revision tracking shall be done in capital alpha character, after the initial numeric revision provided (e.g., revisions to 'Rev 4.0' would be 'Rev 4.0A', 'Rev 4.0B', etc.).

The Contractor shall provide modified Reference Drawings, in approved format, as follows:

1. Posted to the cpudprojects web site, one (1) copy each electronic media (soft copy) including an enclosed master drawing list (with all reference files included);
2. Mailed entire set of all drawings on CD, including an enclosed master drawing list (with all reference files included);
3. One (1) copy each, as a hard copy on Mylar.

4.7.2 Shop Drawings (New Drawings)

1. Approved District Format:
 - a. Electronic file format shall be as described in Electronic File Format, above. The District's preference is to receive DWG (*.dwg) files, but DXF (*.dxf) or TIF (*.tif) files may be accepted with the District's prior approval.
 - b. Contractor shall comply with the National CAD Standard in these areas:
 - 1) CAD Layering Guidelines
 - 2) Tri-Services Plotting Guidelines (plot file will be provided by the District)
 - 3) Drafting Conventions
 - 4) Terms & Abbreviations
 - 5) Symbols
2. Exceptions to the National CAD Standard shall be as follows:
 - a. All shop drawing files shall be drawn at full scale (1:1) in Model Space.
 - b. Acceptable hard copy size shall be as follows as defined in ANSI Y14.1 (preferred size will be at the Engineer's discretion):
 - 1) B-size 11"x17"
 - 2) C-size 18"x24"
 - 3) D-size 22"x34"
 - 4) F-size 30"x42"
 - c. Font shall be **simplex.shx** (provided by District)
 - d. Any use of cross-references ("X-REF") shall be bound within each shop drawing.
 - e. Contractor shall use title block(s), border(s), and shop drawing numbering system provided by the District.
 - f. All drawing files shall be individually named and numbered with a distinct drawing number per sheet.

EXAMPLE: Drawing file name: 0505-61WD-0001.dwg Drawing number: 0505-61WD-0001. Only one (1) drawing per file will be accepted.
3. Each shop drawing shall be identified with the following data:
 - a. Chelan Hydro
 - b. Date: YYYY-MM-DD
 - c. Project designation: Chelan Tailrace Pump Station – Pump Procurement
 - d. Contract number: 07-31
 - e. Drawing information:
 - 1) Title
 - 2) Number: 4141-61aa-nnnn
 - 3) Revision number
 - f. Contractor information:
 - 1) Name
 - 2) Job reference number
4. Each shop drawing shall include:
 - a. A revision-tracking log to indicate changes made since the last revision;
 - b. Date revised;

- c. A clear mark near each change indicating the revision of the change;
- d. An area three (3) inches by three (3) inches left clear, located near the title block for the District's use in marking the drawing's review and approval status.

District drawing numbers shall be placed on all shop drawings by the Contractor. This identification number will be supplied by the Engineer at earliest appropriate time prior to final shop drawing approval and added by the Contractor to each individual shop drawing.

The Contractor shall be responsible in making sure that all Subcontractors conform to these same standards.

A graphical scale and component weights shall be included on each physical drawing.

Non-destructive examination scope, procedures, and acceptance criteria shall be indicated on physical drawings where applicable.

All deviations from the Contract Documents shall be conspicuously marked on the shop drawings or noted on the submittal form and accompanied by a request for deviation.

4.7.3 Electrical Shop Drawings

Electrical shop drawings; schematics, wiring drawings, and panel layout drawings shall be in accordance with established District practice, as reflected in sample drawings provided as part of the Reference Drawings, for typical arrangement, layout, and format or as approved by Engineer.

Electrical shop drawings shall have sufficient detail to facilitate installation and maintenance of items including terminal block identification, component values for resistors, capacitors, etc., and industry standard designations on all semiconductor devices.

4.7.4 As-Built Shop Drawings

Upon Completion of the Work, the Contractor shall revise the Shop Drawings to accurately reflect as-built conditions. Those drawings shall conform to the Contract.

4.7.5 As-Built Reference Drawings

Upon Completion of the Work, the Contractor shall provide the District with one (1) hard copy set of the Reference Drawings, with any as-built marks done as part of the Work, in conformance with this Section.

District-approved, as-built drawings (Shop and Reference as required) shall be included as a deliverable for substantial completion for the contract, and shall conform to Contract Closeout Submittals, Record Drawings, this section.

4.8 CALCULATIONS

The Engineer shall have the right to review any and all of the Contractor's calculations, including all manual and computerized design calculations. If specified and/or requested by the Engineer, the Contractor shall provide all backup calculations, assumptions, flow charts, computer program documentation, and all other data necessary for proper review of the material by the Engineer.

5.0 PROJECT SCHEDULES

5.1 GENERAL

The Contractor shall prepare and maintain Project schedules. Schedules shall be prepared and maintained in a District approved software format. Schedule submittals shall be posted to the cpudprojects web site and three (3) hard copies delivered to the Engineer. Schedule logic shall be included and the critical path calculated and indicated.

Schedules shall be updated to reflect all changes and to show progress, and submitted at least two (2) days prior to each scheduled Progress Meeting. Updates shall indicate actual progress against a baseline schedule established at the beginning of the project. Additionally, the Schedule shall be updated and resubmitted within five (5) working days of any change known by the Contractor that could cause actual completion dates to exceed the Contract Dates specified in the Contract Documents.

5.2 COMBINED PROJECT AND PRODUCTION SCHEDULE AND PROGRESS CHART

The Contractor shall prepare within 30 days following Notice of Award, but no less than 15 days prior to starting fabrication or construction (approval required prior to starting construction), and maintain a time scaled CPM (Critical Path Method) Schedule showing all significant activities from Contract award to final closeout. This Schedule shall show all major events, activities, milestones, and completion dates required for Completion of the Work.

The Overall Schedule shall include, as a minimum, the start date, duration time in days and the completion date for the following work items:

1. Planning and Design Activities, including Engineering
2. Submittal preparation with reference to Specification Section
3. District response to Submittals
4. Resubmittals (preparation and review) as applicable
5. Procurement and Receipt of Materials
6. Fabrication, Assembly, and Shop Testing Dates for Major Components
7. Shipment and Delivery of equipment/material to Job Site
8. Construction (as a rollout)

9. Construction Phases (as children to the rollup) including Installation, Field Testing, and Acceptance Testing
10. Substantial Completion
11. Contract Dates for Completion, as specified in Section D

The Contractor shall assign such forces and perform the Work in such a manner as to assure compliance with the Approved Schedule and the Contract. The Contractor shall inform the Engineer of any Schedule changes.

6.0 CONTRACT CLOSE-OUT SUBMITTALS

6.1 RECORD DRAWINGS

After District's final approval, submit the following as part of the final As-built Record Drawings Submittal, which will include all Shop Drawings and marked-up Reference drawings including any changes made up to the time that the Work is completed and accepted, and all As-Built and field changes, in accordance with this Section:

1. One (1) complete, hard copy set of full-size, reproducible, final Drawings (Shop and Reference) on Mylar;
2. One (1) electronic media copy (soft copy) set of all drawings (Shop and Reference as required) on CD, including an enclosed master drawing list (with all reference files included);
3. Post final as-built drawings (Shop and Reference as required) to the cpudprojects web site.

6.2 RECORD DOCUMENTS

Post record documents to the cpudprojects website and furnish one (1) complete set of record documents in hard copy to the Engineer, including, but not limited to, the following:

1. QA/QC Documentation.
2. Operation and Maintenance Manuals
3. Certificates of Compliance and Proper Installation.
4. Warranty Documentation.

Furnish duplicate copies of warranty documents that are executed and transferable from Subcontractors, suppliers, and manufacturers as applicable.

Final Documentation Submittal shall be a compilation of documents described above in 6.2, items 1 through 4, in order shown above into a three ring binder. Provide four (4) copies. Cover sheet for this binder shall include similar formatting and the following:

**CHELAN TAILRACE PUMP STATION
PUMP PROCUREMENT**

**NAME OF DOCUMENT
(i.e., OPERATIONS AND MAINTENANCE MANUAL, QA/QC Dossier, etc)**

(NAME OF CONTRACTOR)

CONTRACT NO. 07-31

(Date)

7.0 LIST OF APPENDICES

APPENDIX 7.1 - CONTRACTOR SUBMITTAL AND DISTRICT REPLY FORM
APPENDIX 7.2 - SPEEDY MEMO FORM
APPENDIX 7.3 - RECORD OF CONVERSATION FORM
APPENDIX 7.4 - SHOWING HOW TO PROPERLY IDENTIFY EMBEDDED
DOCUMENTS, CATALOG CUT SHEETS, ETC.

7.1 SAMPLE: CONTRACTOR SUBMITTAL AND DISTRICT REPLY FORM

CONTRACTOR SUBMITTAL & DISTRICT REPLY FORM			
Submittal No.: 07-31XXXX-S-XXXX -0			
TO:	Chelan Tailrace Pump Station, Project Manager ATTN: Mr. Gene Yow P.U.D. No. 1 of Chelan County 327 N. Wenatchee Ave Wenatchee, WA 98801	Project: Contract 07-31 Chelan Tailrace Pump Station – Pump Procurement	
		Date Submitted:	
FRO M:		Approved Submittal Schedule Date:	
Submittal Type:	<input type="checkbox"/> Shop Drawing	<input type="checkbox"/> Administrative	<input type="checkbox"/> Sample
No. of Copies:	<input type="checkbox"/> Quality Control	<input type="checkbox"/> Contract Closeout	<input type="checkbox"/> "Or-Equal"/Substitute

CONTRACTOR SUBMITTAL:						DISTRICT REPLY:		
N o.	CPUD REF-if app	Spec & Para No.	Description of Item (Type Size, Model No, etc.)	Drawing or Brochure No.	Contra ct Variati on N-or-Y	Status*	Action**	Reviewed by & Date
1.								
2.								
3.								
4.								

Contractor Comments:

Contractor hereby certifies that (i) contractor has complied with the requirements of Contract Documents in preparation, review, and submission of designated Submittal and (ii) the Submittal is complete and in accordance with the Contract Documents and requirements of laws and regulations and governing agencies.

By: _____
CONTRACTOR (Authorized Signature)

District Comments:

Review is for general conformance with the design concept and contract documents. Markings or comments shall not be construed as relieving the Contractor from compliance with the contract documents. The Contractor remains responsible for details and accuracy, for confirming and correlating all quantities and dimensions for fabrication processes; for techniques of assembly; and performing the work safely.

Status*:	Action**:
ANR – Approval Not Required	NR – No Action Required
APP – Approved	REV – Revise and Resubmit for Approval
AAR – Approved as Revised	RSR – Revise and Submit for Record
NOT APP – Not Approved	SR – Submit for Record

7.2 SAMPLE: SPEEDY MEMO

SPEEDY MEMO			
		Speedy Memo Number: 07-31-XXXX-MXXXX-0	
Date:			
To:			
From:			
Project:	Contract 07-31 - Chelan Tailrace Pump Station – Pump Procurement		
Regarding:			
Description/Request:			
Requested Due Date:			
Attachments:		By:	
Copy:		Date:	
Response Assigned To (Names(s) and/or Organization(s)):			
Response A:			
Attachments:		By:	
Copy:		Date:	
CCPUD Action Required:			
<input type="checkbox"/>	Follow Up	<input type="checkbox"/>	Variance
<input type="checkbox"/>		<input type="checkbox"/>	Field Order / Change Order
<input type="checkbox"/>		<input type="checkbox"/>	DWG/Spec Revision
<input type="checkbox"/>		<input type="checkbox"/>	Other:
Action Completed:			
By:			Date:

7.3 SAMPLE: RECORD OF CONVERSATION

RECORD OF CONVERSATION			
Check one:		<input type="checkbox"/> Phone Call	<input type="checkbox"/> Personal Contact
Date:		Time:	ROC No. 07-31-XXXX-RXXXX-0
Project:	Contract: 07-31 Chelan Tailrace Pump Station – Pump Procurement		
Person(s) Talked With:		Company / Phone Number:	
Conversation Summary:			
Significant Decisions:			
Required Actions/Follow-up:			
Signature:		Date:	
Distribution:			

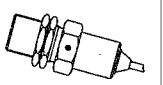
7.4 SAMPLE: SHOWING HOW TO PROPERLY IDENTIFY EMBEDDED DOCUMENTS, CATALOG CUT SHEETS, ETC.

JAUQUET
TECHNOLOGY GROUP

DSD 2210 A, S, M

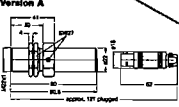
Features

- With amplifier
- Static function
- Lower frequency limit: 0 Hz
- Sensor housing has to be aligned to the pole wheel

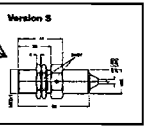


Dimensions

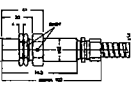
Version A



Version S



Version M



Model overview

Type	Part nr.	Connections	Housing Thread	Weight [g]	Operating [°C]	Noise
DSD 2210A1 BTV	3742-03750	Cable 5 m	M20x1	550	-25...+85	Standard
DSD 2210S1 BTV	3742-03750	Cable 5 m	M20x1	220	-25...+125	Standard
DSD 2210S1 ATV	3742-04170	Converter	M20x1	130	-25...+85	Standard
DSD 2210S1 AUV	3742-04171	Converter	M20x1	130	-25...+125	Standard
DSD 2210S1 BTV	3742-04146	Protective hose 5 m	M20x1	1000	-25...+85	Standard
DSD 2210S1 BTV	3742-04120	Cable 5 m	M20x1	250	-25...+85	Standard

0401B-VATH-M0114-0 Att1 w-remarks.pdf

JAUQUET
TECHNOLOGY GROUP

Differential Ferrostat Sensor
Type DSD 2210
Version A, S, M

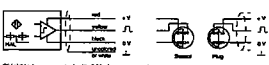
Technical data

Supply
Power supply: Steady voltage: 8...30 V D.C., max. superimposed A.C. voltage 25 mVrms;
reverse polarity protection;
Current consumption: max. 18 mA (without load).

Input
Frequency range: 0 Hz...20 kHz;
Noise immunity: Cable shield connected to the supply negative pole. Noise generator between housing and electrode;
1.5 kV/1.3 mVrms, 5 Hz (passive resistance 500 Ω);
2.5 kV/1.3 mVrms (dwell = 1 s in accordance with IEC 101-4);
2.5 kV/1.3 mVrms damped resonance (dwell 20 s in accordance with IEC 101-4);
Ferroresonant: applied voltage (i.e. U_{MT-2}), housing gear bars performed: Module 2: 1 min, tooth width 6 mm, side offset with min. tooth width = 0.2 mm, accuracy ± 0.2 mm;
Data added sensor cable (BT):
Module 1: 0.1...0.2 mm
Module 2: 0.1...1.3 mm
Module 4: 0.1...1.5 mm

Output
Signal output: Square wave signal from push-pull stage, D.C. coupled to the supply
(negative pole = reference voltage), max. load 25 mA;
Output voltage (U_o) = steady voltage: 1.5 V at I = 25 mA;
Output voltage (U_o) = 1.3 V at I = 25 mA;
short circuit proof with reverse polarity protection.

Connections



Shield to be connected with 0 V of power supply.

Electrical
Protection class: IP68 (fixed), IP67 (cable connection), IP50 (jack connection).
Vibration immunity: 5 g, in the range 5...2000 Hz;
Shock immunity: 50 g, during 20 ms, half sine wave;
Operating temperature: Acc. to model overview;
Insulation: Housing, cable screening and electrode galvanically isolated (500V/50 Hz) min.;
Housing: Stainless steel, front side hermetically sealed, electronic components passed in a chemical and age proof synthetic resin;
Dimensions according to model overview and dimensional drawing;
Acc. to model overview;
Weight: 3742-03750, version with integral cable; 3742-03750, version with integral connector;
Operating instructions: 3742-03750, version with integral cable; 3742-03750, version with integral connector.

Wires

Version DT (S1): PVC cable: Part nr. 824L-30053, 5-wire, 3 x 0.75 mm² stranded wire (shield not insulated from housing), grey; Outer Ø = max. 7.4 mm; Bending radius = min. 1.0 mm; weight 60 g/m; Standard length for version DT: 5 m.

Version DT (S2): PVC cable: Part nr. 824L-30465, 5-wire, 3 x 0.22 mm² (AWG 34), stranded wire (shield not insulated from housing), grey; Outer Ø = max. 4.2 mm; Bending radius = min. 60 mm; weight 28 g/m; Standard length for version DT: 5 m.

Version SH: Teflon cable: Part nr. 824L-30053, 5-wire, 4 x 0.54 mm² (AWG 24), stranded wire (shield not insulated from housing), white; Outer Ø = max. 4.0 mm; Bending radius = min. 60 mm; weight 12 g/m; Standard length for version SH: 5 m.

Version MT: Protective base coat: PVC cable: Tube 8255-30024 made of profile milled steel plate with PVC cover, grey; Weather and waterproof, conditionally oil and acid resistant; Outer Ø = 14 mm; Bending radius = min. 40 mm; weight 130 g/m; Standard length for version MT: 5 m.

Version A: Connection base: Part nr. 824A-35731; Connection cable: Part nr. 824A-35732.

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END OF SECTION 01300

SECTION 01311

COORDINATION AND MEETINGS

TABLE OF CONTENTS

1.0	GENERAL	2
1.1	COORDINATION.....	2
1.2	POST-AWARD MEETING.....	2
1.3	COORDINATION AND DESIGN REVIEW MEETINGS	2
1.4	PRECONSTRUCTION CONFERENCE	3
1.5	WEEKLY PROGRESS MEETINGS	3
1.6	RECORD DRAWINGS REVIEW MEETING.....	4
2.0	PRODUCTS (NOT USED).....	4
3.0	EXECUTION (NOT USED)	4

SECTION 01311

COORDINATION AND MEETINGS

1.0 GENERAL

1.1 COORDINATION

Contractor shall submit to District and Engineer:

1. The Contractor's official correspondence address.
2. The address, telephone number, and fax number of Contractor's representative who will be the Project Manager for the Contract.

Expenses: For attendance at all meetings described in this Section, all participants will be responsible for their own expenses without additional compensation by the District.

1.2 POST-AWARD MEETING

1.2.1 Schedule

The post-award meeting will be held at the District's office in Wenatchee, WA.

1.2.2 Meeting Agenda

The meeting agenda will be prepared by the Engineer in advance of the meeting. Agenda will include a review of the Specification requirements, Contractor's proposal, and schedule.

1.2.3 Meeting Participants

The Contractor and representatives for the major Subcontractors shall participate in the post-award meeting.

1.3 COORDINATION AND DESIGN REVIEW MEETINGS

1.3.1 Schedule

It is anticipated that a minimum of three design review meetings will be held. The dates and times will be determined by the Engineer.

1.3.2 Location

Two design review meetings will be held at the District's offices in Wenatchee or the Engineer's offices in the Seattle, WA, area. A control system software development coordination meeting will be held at the District's offices in Wenatchee or the Engineer's offices in the Seattle, WA. Area. Reference Section 16700, Pump Control Panel, for meeting requirements.

1.3.3 Meeting Agenda

Agenda will include a review of the schedule submitted by the Contractor, including its progress reports, outstanding submittals, and change requests. The meeting shall define coordination requirements with the other contractors and review the design progress and shipping/delivery arrangements.

1.3.4 Meeting Participants

The Contractor and representatives from the major Subcontractors, as required by the Engineer, shall participate in the meetings.

1.4 PRECONSTRUCTION CONFERENCE

1.4.1 General

Prior to the installation of the equipment (by others) a preconstruction conference will be held at the location, date, and time to be designated by the Engineer. The Contractor's Installation Supervisor, who will be providing supervision for installation of the equipment, shall attend.

1.4.2 Agenda

The matters to be discussed at the preconstruction meeting include:

1. Installation schedule and progress reports to be submitted by other contractors.
2. Communication and general correspondence procedures between the parties.
3. The names and titles of all persons authorized by the Contractor to represent and execute documents for him with samples of all authorized signatures.
4. The names, addresses, and telephone numbers of all those authorized by the Contractor to act for it in emergencies.
5. Access and rights-of-way furnished by the Owner.
6. Other administrative and general matters as needed.
7. Emergency telephone numbers for doctors, hospital, ambulance service, etc.
8. Site layout. Location of field office.
9. Installation contractor's progress meetings to be attended by installation supervisor.
10. Safety regulations as required by OSHA.

1.5 WEEKLY PROGRESS MEETINGS

During equipment installation, meetings will be held at least weekly or more frequently as needed or called by the installation contractor or the Engineer. All matters bearing on the progress and performance of the Work since the preceding progress meeting will be discussed and resolved; including, without limitation, any previously unresolved matters; deficiencies in the Work or the methods being employed for the Work; and problems, difficulties, or delays which may be encountered; in order that the Work may be

constructed on schedule and within cost. The Contractor's installation supervisor, who will be providing supervision, shall attend.

1.6 RECORD DRAWINGS REVIEW MEETING

A record drawing review meeting will be held at the District's office or project office to discuss and summarize the changes to Contract Drawings, to discuss the punch list items, and to discuss contractual matters.

Upon completion of the project, the Contractor shall submit Project Record Drawings, including manufacturers' reproducible Record Drawings reflecting all field changes concerning the document package addressed in Section 01010, Summary of Work, and in Section 01300, Administrative Requirements, to the Engineer before final payment will be made. Drawing format shall be one copy of the drawings in electronic format and two paper copies of the Project Record Drawings.

2.0 PRODUCTS (NOT USED)

3.0 EXECUTION (NOT USED)

END OF SECTION 01311

SECTION 01330

INSTRUCTIONS AND MANUALS

TABLE OF CONTENTS

1.0	GENERAL	2
2.0	FORMAT.....	2
2.1	CONSTRUCTION	2
2.2	ORGANIZATION	3
2.3	DRAWINGS	3
2.4	ELECTRONIC.....	4
3.0	INSTALLATION INSTRUCTIONS	4
4.0	OPERATION AND MAINTENANCE MANUALS.....	4
4.1	SCOPE.....	4
4.2	ORGANIZATION	4
4.3	CONTENTS	5
5.0	SUBMITTAL PROCEDURE	7
5.1	INSTALLATION INSTRUCTION OUTLINE	7
5.2	O&M MANUAL OUTLINE	7

SECTION 01330

INSTRUCTIONS AND MANUALS

1.0 GENERAL

The Contractor shall furnish Installation Instructions and Operation and Maintenance (O&M) Manuals for all equipment furnished under this Contract. Installation Instructions shall be submitted and approved prior to start of any work on site. O&M Manuals shall be submitted and approved before commissioning as specified herein.

The Contractor shall be responsible for ensuring complete submittals on individual interrelated equipment components provided by Subcontractors, suppliers and manufacturers.

2.0 FORMAT

2.1 CONSTRUCTION

Installation Instructions and O&M Manuals shall be printed on 20-pound weight minimum, 8½ by 11 inch bright white paper and bound in ridged hard cover binders. Binder width shall be a maximum of three (3) inches. Binders shall be such that pages are locked in place and do not inadvertently fall out, Wilson-Jones 365, Avery Dennison Heavy Duty EZD series or District approved equal. Punched holes shall be arranged such that they do not remove or obliterate data.

Indexes shall be provided for each Installation Instruction and O&M Manual including dividers and tabs to separate sections of each binder. Vinyl binder sheets for CD and diskette media storage, for software and data shall be included in the appropriate Installation Instruction and O&M Manual. For CD/DVD media storage, use Fellowes CD Binder Sheets, #95304 or District approved equal. For 3.5 inch diskette media storage use Fellowes, 3.5" Diskette Binder Sheets, #95371 or District approved equal.

Text shall be manufacturer's printed data, or neatly typewritten suitable for reproduction, with quality equal to original. Photocopying of material will be acceptable, except for material containing photographs. All standard catalog cut sheets, manufacturer's printed data or descriptive literature, parts sheets, illustrations, etc., shall either be original manufacturer sheets or reproduced copies equal in clarity and durability to the original copies. At least one (1) copy of such Installation Instructions and O&M Manuals shall contain all original copies of such data – that copy shall be identified as containing originals.

2.2 ORGANIZATION

Identify each volume with typed or printed cover and title page as follows:

**PUBLIC UTILITY DISTRICT NO. 1 OF CHELAN COUNTY
CHELAN TAILRACE PUMP STATION
PUMP PROCUREMENT**

(INSTALLATION INSTRUCTIONS or OPERATIONS AND MAINTENANCE MANUAL)

VOLUME Number x OF y

CONTRACT Number 07-31

[DATE]

[NAME AND ADDRESS OF EQUIPMENT SUPPLIER]

The table of contents shall contain all volumes, chapters, appendixes and a master index. Where more than one volume is required, each subsequent volume shall contain an index for the contents within that respective volume. Each volume shall not be broken between chapters, appendixes, and indexes. Each sheet in the binder shall be numbered and an index provided for ready reference to the data.

All chapters, appendixes and indexes shall be adequately separated and identified by standard line indexes.

2.3 DRAWINGS

Final Installation Instructions and O&M Manuals shall contain As-Built Contract and Shop Drawings (as required) to ensure correct illustration of completed installation.

Drawings may be reduced to 8-½ inches by 11 inches, or 11 inches by 17 inches folded to 8-½ inches by 11 inches.

Reduced drawings shall be inserted into Installation Instructions and O&M Manuals using:

1. Ring Binder Insert Strips, Cardinal #21110;
2. 11x17 Fold out Sheet Protectors, Avery® #75256 or;
3. Other District approved equal.

Where reduction of drawings is impractical, fold and insert drawings in vinyl, Multi-page capacity, sheet protectors, Avery® #PV119XL-25 (74171). Insert drawing with title and number viewable from front side of page, when inserted into sheet-protector.

2.4 ELECTRONIC

Electronic copies of final Installation Instructions and O&M Manuals, once approved shall be provided. All provided files shall maintain the formats and standards as required in Section 01300, Administrative Requirements. All files shall be named for the section of the Installation Instruction or O&M Manual that is represented within the file or as approved by the Engineer. All PDF (*.pdf) files shall also be accompanied by the associated 'native' files used to create those PDF (*.pdf) files. PDF (*.pdf) 'native' files shall also follow the required file formats and standards. Electronic files shall be submitted on CD ROM.

3.0 INSTALLATION INSTRUCTIONS

Installation instructions shall include all steps necessary for the proper assembly and installation of the Work. Detailed procedures, figures, and diagrams shall be included for specific activities to assemble the equipment. Procedures and data sheets shall be included for all in-progress measurements and inspections and tests, including acceptable tolerances and pass/fail criteria.

4.0 OPERATION AND MAINTENANCE MANUALS

4.1 SCOPE

O&M Manuals shall describe recommended procedures in detail. A detailed theory of operation shall be provided for all equipment. A schedule shall give recommended times for maintenance, lubrication, calibration, and replacement of parts.

O&M Manuals shall include a complete set of drawings with details including dimensions, component values, and industry standard component designations where appropriate.

A parts identification list, with appropriate illustrations identifying each numbered part and its location in the assembled equipment shall be included. All parts shall be identified using industry standard designations or dimensions to the fullest extent possible.

4.2 ORGANIZATION

A single O&M Manual made up of similar multiple volumes shall be provided. Major divisions within the manual shall be provided for:

1. Contact Information
2. Warranty Information
3. Commissioning Procedures

4. Operating Instructions
5. Maintenance Instructions
6. Trouble Shooting
7. Equipment Listing followed by data sheets
8. Mechanical Drawings
9. Electrical Drawings

4.3 CONTENTS

4.3.1 General

The following general information shall be provided:

1. Names addresses and telephone numbers of Contractor, Subcontractors and equipment/material suppliers for warranty and maintenance contact.
2. Certificates of equipment warranty with the start and expiration of the warranty period clearly described.
3. Service agreements with equipment manufacturers as applicable.
4. Description of instances that may affect the validity of the warranty.
5. Instrument List including identification and alarm and trip settings.

4.3.2 Equipment Sections

The major sections of the manual shall have the following contents as appropriate:

1. Equipment specifications that include the following:
 - a. Nameplate Ratings including: voltage, amperage, kW, power factor, RPM, horsepower, temperature, etc., as appropriate.
 - b. Factory Settings including: temperature, travel speed, limits of travel, etc. Where there is a range to these values, state as: "Normal Operating Range".
 - c. Factory Trip Settings as applicable to the equipment.
 - d. Dimensions and Weight of major components.
 - e. Performance curves.
 - f. Engineering data.
2. Test data from factory tests and acceptance tests.
3. System/equipment description and operating theory including a description of significant equipment, components and functions for a complete understanding of the design and operation of the equipment or system. Diagrams and part lists shall be included or referred to as appropriate.
4. Operating Instructions shall be written in a logical sequence including systematic (step-by-step) procedures for operation.
5. Maintenance instructions including:
 - a. Recommended procedures for meeting warranty requirements ensuring optimal performance and longevity of the provided equipment.

- b. Recommended maintenance schedule with references to the appropriate procedures.
- 6. Guide to troubleshooting with references to the appropriate maintenance procedures.
- 7. Part descriptions and diagrams including references to drawings and manufacturers' part numbers as applicable.
- 8. Instructions for repair and adjustment including recommended clearances, bolt torques, pressure settings, etc.
- 9. Lubrication instructions for the service intended and shall include charts or tables indicating items to be lubricated, recommended frequencies, grade and type of lubricant to be used in accordance with AGMA, NLGI, SAE specifications, as applicable. Where the Contractor or the supplier has installed a lubricant or oil prior to shipment to the project site, the "Brand Name" as well as the specification shall be indicated.
- 10. A listing of the oil, fuel, and other fluid quantities required for filling and operation of fluid-containing systems.
- 11. Any special handling or storage requirements.
- 12. A list of any special tools required for maintenance or repairs.
- 13. Recommended spare parts including identification, nomenclature, part numbers, required number of parts, recommended list of spare parts to be stocked at the project, actual spare parts supplied under this contract and instructions for ordering spare parts.
- 14. Parts catalogs shall include the name and addresses of suppliers of parts. All data shall match the actual equipment furnished. Standard catalog cut sheets and diagrams will not be acceptable unless all irrelevant parts are marked out and relevant parts are identified by heavy arrows or equal suitable marking at each side of the applicable data.
- 15. Drawings:
 - a. Assembly and installation drawings.
 - b. Drawings showing relations of component parts of equipment and systems.
 - c. Control and interlock system diagrams.
 - d. Logic and flow diagrams.
 - e. Communication diagrams.
 - f. Schematic and wiring diagrams.
- 16. List of relay and alarm settings.
- 17. Software: Full documentation of software. Identify system or equipment and provide control logic and screen graphics both in printed and electronic format. Include original manufacturer's instructions.
- 18. Programming instructions for all software based equipment. A complete listing of all software parameters shall be included.

5.0 SUBMITTAL PROCEDURE

Contractor shall submit the following as shown on the Submittal Schedule:

5.1 INSTALLATION INSTRUCTION OUTLINE

Submit detailed outline, which includes the Table of Contents of Instruction prior to preparation of Preliminary Instructions, for each crane.

1. Preliminary Installation Instruction:
 - a. Submit two (2) bound copies of Preliminary Installation Instructions. Submit one (1) copy in electronic format.
 - b. The Engineer shall review the Preliminary Installation Instructions in accordance with the Project Correspondence Procedures, Section 01300.
2. Final Installation Instructions:
 - a. Submit one (1) revised Final Installation Instruction incorporating the comments from the Preliminary Installation Instructions for review by Engineer.
 - b. If accepted, submit an additional two (2) copies for a total of three (3) Final Installation Instructions and one (1) copies in electronic format.
 - c. If rejected, one (1) copy will be returned to the Contractor with the Engineer's comments for revision and resubmittal.

5.2 O&M MANUAL OUTLINE

Submit detailed outline, which includes the Table of Contents of O&M Manual prior to preparation of Preliminary Manuals.

1. Preliminary O&M Manuals:
 - a. Submit two (2) bound copies of Preliminary O&M Manuals. Submit one (1) copy in electronic format.
 - b. The Engineer shall review the Preliminary O&M Manuals in accordance with the Project Correspondence Procedures.
2. Final O&M Manuals:
 - a. Submit two (2) revised Final O&M Manuals incorporating the comments from the Preliminary O&M Manuals for review by Engineer.
 - b. If accepted, submit an additional four (4) copies for a total of five (5) Final O&M Manuals and two (2) copies in electronic format.
 - c. If rejected, one (1) copy will be returned to the Contractor with the Engineer's comments for revision and resubmittal.
 - d. O&M Manuals used for On-site training shall be additional, and provided for each session, unless otherwise approved by Engineer.

The District's acceptance as "Approved" or "Approved as Revised" shall apply to the general content and shall not relieve the Contractor from the entire responsibility for correctness.

Regardless of approval status, the Contractor shall be responsible for updating the appropriate sections of the Installation Instructions and O&M Manuals as required to incorporate any changes to the Work resulting from drawing revisions, change orders, as-found conditions, etc. which affect the content of the Installation Instructions and O&M Manuals throughout the life of the Contract, in accordance with Section 01300.

END OF SECTION 01330

SECTION 01420

REFERENCES – CODES AND STANDARDS

TABLE OF CONTENTS

1.0	GENERAL	2
2.0	ALTERNATIVE STANDARDS OR CODES	2
3.0	STANDARDS AND CODES	2
3.1	GENERAL STANDARDS	2
4.0	APPLICABILITY	3

SECTION 01420

REFERENCES – CODES AND STANDARDS

1.0 GENERAL

All supplied equipment/materials shall be designed, fabricated, and tested in accordance with this Specification, and the latest applicable industry standards and codes. Any deviations from the following standards shall be clearly stated as exceptions in the proposal. Unless otherwise specified, the latest edition of each standard shall be used.

2.0 ALTERNATIVE STANDARDS OR CODES

Contractor may submit for approval by Engineer an alternative standard or code, which Contractor believes most closely, approximates the specified standard or code. Contractor shall include the designation of the specified standard or code, the designation and originating authority of the proposed alternative standard or code, and the text of the proposed alternative in the English language. Contractor shall also indicate the material parts and/or systems to which the alternative standard or code shall be applied.

Engineer may approve the use of alternate equivalent recognized international standards; however the requirements regarding properties, workmanship, quality and testing specified in the listed standards shall apply for all equivalent standards proposed.

3.0 STANDARDS AND CODES

3.1 GENERAL STANDARDS

The following general standards and codes may be applicable to the Project. Additional specific standards are listed in applicable sections of the equipment to be manufactured and installed.

Organization	Abbreviation
Aerospace Standard	AS
American Concrete Institute	ACI
Anti-Friction Bearing Manufacturers Association	AFBMA
American Gear Manufacturers Association	AGMA
American Institute of Steel Construction	AISC
American Iron and Steel Institute	AISI

Organization	Abbreviation
American National Standards Institute	ANSI
American Petroleum Institute	API
American Society of Civil Engineers	ASCE
American Society of Mechanical Engineers	ASME
American Society for Non-Destructive Testing	ASNT
American Society for Testing and Materials	ASTM
American Welding Society	AWS
Code of Federal Regulations	CFR
Canadian Electrical Association	CEA
Environmental Protection Agency	EPA
Hydraulic Institute Standards	HIS
Institute of Electrical and Electronic Engineers	IEEE
International Building Code	IBC
International Electrotechnical Commission	IEC
Instrumentation, Systems, and Automation Society	ISA
International Standards Organization	ISO
National Electrical Code	NEC
National Electrical Manufacturing Association	NEMA
National Fire Protection Association	NFPA
National Institute of Standards and Technology	NIST
Occupational Safety and Health Administration	OSHA
Society of Automotive Engineers	SAE
Steel Structures Painting Council	SSPC
State of Washington – Washington Administrative Code	WAC
State of Washington – Revised Code of Washington	RCW
Underwriters Laboratories Inc.	UL

4.0 APPLICABILITY

Each standard forms an integral part of this Document. If a conflict between standards, or a standard and this Document occurs, then the one shall govern which has the most restrictive requirements unless otherwise stated in writing by District.

Contractor shall comply with any new or revised laws, standards, and codes that apply to the Work by Contractor.

Throughout the duration of this Contract, Contractor shall remain apprised of any revisions to laws, standards and codes, which apply to the Work by Contractor. Contractor shall immediately notify Engineer of any revisions to laws, standards and codes that affect the Work by Contractor.

Notwithstanding the provision of any standard or code applicable to the Work, Contractor shall be exclusively responsible for proper design, manufacture, installation, inspection and testing of the work to assure that it meets all requirements of the Contract.

END OF SECTION 01420

SECTION 01450

CONTRACTOR QUALITY CONTROL

TABLE OF CONTENTS

1.0	GENERAL	2
1.1	REFERENCE SPECIFICATIONS, CODES AND STANDARDS.....	3
1.2	CONTRACTOR QUALITY CONTROL PLAN	3
1.3	COORDINATION MEETING	4
1.4	CONTROL OF NON-CONFORMANCES	4
1.5	QUALITY RECORDS	4
1.6	CERTIFICATE OF COMPLIANCE	5
1.7	CERTIFICATION OF PROPER INSTALLATION	5
2.0	PRODUCTS (NOT USED).....	6
3.0	EXECUTION (NOT USED)	6
4.0	APPENDICES.....	7
4.1	APPENDIX A - CERTIFICATE OF COMPLIANCE.....	7
4.2	APPENDIX B - CERTIFICATE OF PROPER INSTALLATION	8

SECTION 01450

CONTRACTOR QUALITY CONTROL

1.0 GENERAL

The Contractor is responsible for quality control and shall establish and maintain an effective quality control system for both off-site and on-site work. The quality control system shall consist of plans, procedures, and organization necessary to produce an end product which complies with the Contract requirements.

The Contractor shall develop a Quality Control Plan for all phases of the Work in accordance with ANSI/ASQC E1 and E2. The requirements of this section apply to the Contractor and all Subcontractors.

The Contractor Quality Control (CQC) Plan shall clearly establish the authority and responsibility of those responsible for the administration, inspections, tests and plan execution.

Contractor shall maintain the CQC Plan organizational chart to reflect the actual organization and lines of authority throughout the duration of the Contract.

The Contractor shall monitor quality control of suppliers, manufacturers, material, equipment, services, site conditions and workmanship to produce Work of specified quality.

The Contractor shall comply with specified standards as a minimum quality for the Work except when more stringent tolerances or specific requirements in these Contract documents indicate higher quality or more precise workmanship.

The Contractor shall comply with manufacturer's instructions and procedures, where applicable.

The CQC Plan shall be available for review by the District at any time.

District reserves right to audit Contractor facilities for purpose of verifying compliance with District approved CQC Plan.

Rework caused by failure to follow approved CQC Plan shall be at Contractor's expense.

Additional specifications and standards for special processes are specified in other sections of this document. Specifications for special processes located in other sections of this document are "in addition to" those specified in this section. They do not relieve Contractor from compliance with this section.

Should conflicts arise between different or overlapping standards and the technical Specifications, District reserves the right to determine the applicable standard.

1.1 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

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

1. American National Standards Institute (ANSI)/American Society For Quality Control (ASQC):
 - a. ANSI/ASQC E1, Quality Program Guidelines for Project Phase of Non-nuclear Power Generation Facilities.
 - b. ANSI/ASQC E2, Guide to Inspection Planning.
2. Code of Federal Regulations (CFR).
3. National Institute of Standards and Technology (NIST).

1.2 CONTRACTOR QUALITY CONTROL PLAN

The Contractor shall furnish for review by the District, not later than thirty (30) calendar days before start of any work, the Contractor Quality Control (CQC) Plan.

The CQC plan shall include, as a minimum, the following to cover all Work including work by Subcontractors, fabricators, and suppliers:

1. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a CQC function.
2. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of Subcontractors, off-site fabricators, suppliers and purchasing agents.
3. An Inspection and Test Plan (ITP). The Contractor shall submit a separate ITP for work performed in the shop and in the field.
4. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test. Laboratory facilities will be subject to approval by the District.
5. Reporting procedures, including proposed reporting formats.
6. The CQC Plan shall also contain procedures for Control of Inspection Records, Traceability of Materials, Test Procedures, Packaging and Shipping Procedures, Storage and Handling Instructions, Witness and Hold Points, and Procedures for Control of Nonconforming Items.

1.2.1 Acceptance of Plan

The CQC Plan shall be subject to approval and verification by District.

After acceptance of the CQC Plan, the Contractor shall notify the District in writing a minimum of seven calendar days prior to any proposed change. Proposed changes are subject to acceptance by the District.

1.3 COORDINATION MEETING

Before start of construction, and prior to acceptance by the District of the Quality Control Plan, the Contractor shall meet with the Project Manager or Authorized Representative and discuss the Contractor's quality control system. During the meeting, a mutual understanding of the system details shall be developed, including the forms for recording the CQC operations, control activities, testing, administration of the system, and the interrelationship of Contractor's Management and control with the District's Quality Assurance inspection. Minutes of the meeting will be prepared by the District and signed by both the Contractor and the Project Manager. The minutes shall become a part of the Contract file.

1.4 CONTROL OF NON-CONFORMANCES

As a part of its Quality Control and Quality Assurance Plan, the Contractor shall:

1. Define a procedure for preventing nonconforming materials and equipment that do not meet standards, criteria or Specifications from being inadvertently used for this Project.
2. Nonconforming materials and equipment that do not meet Contract standards, criteria or Specifications inadvertently used for this Project shall be resolved as a price deduction, repair, return to source, scrap, or rework at the discretion of the District.
3. Any request for approval for deviations or nonconformance to the Contract documents or Quality Control Plan shall be made to the Engineer in writing.
4. A Nonconformance Report (NCR) shall be written and submitted to the District for each nonconforming item. As a minimum, the NCR shall 1) describe the system or part in nonconformance, 2) make reference to the controlling plan, specification, or procedure in violation, 3) include the Contractor's recommended disposition, and 4) signatures of the Contractor's Quality and Engineering personnel. An NCR Form shall be submitted to the District for approval prior to first use.

1.5 QUALITY RECORDS

The CQC Assurance Plan shall define the records that must be prepared and maintained. Such records shall include data, which could be required for future reference. This includes but is not limited to, as-built conditions, material certifications, installation records, and warranty.

Reports of tests and inspections shall be written for each test/inspection. All reports shall show the approved procedure, latest revision, the results, the date, the identification of the inspector or tester and the item examined.

The records shall be controlled by the Contractor to provide easy access for record retrieval and maintenance. All records shall be made available to the District upon request for inspection or the District's use.

1.6 CERTIFICATE OF COMPLIANCE

When specified in individual Specification sections, submit certificate prior to shipment or use of material or equipment. Use the form included at the end this section. Contractor's representative officially responsible for assuring that all requirements of these Contract Documents are met shall sign the Certification of Compliance.

District may permit use of certain materials or assemblies prior to sampling and testing if accompanied by accepted Certification of Compliance.

Certificate shall be signed by manufacturer and/or Contractor certifying that material or equipment provided conforms to or exceeds the requirements of the Specifications. Attach supporting reference data, affidavits and certifications as appropriate.

Material or equipment used on the basis of a Certification of Compliance may be sampled and tested at any time. The fact that material or equipment is used on the basis of a Certification of Compliance shall not relieve Contractor of responsibility for incorporating material or equipment in the Work which conforms to requirements of the Contract Documents. Material or equipment not conforming to such requirements may be subject to rejection whether in-place or not.

District reserves the right to refuse permission for use of material or equipment on the basis of a Certification of Compliance.

1.7 CERTIFICATION OF PROPER INSTALLATION

When specified in individual Specification sections, submit certificate after installation of material or equipment. Use the form at the end of this section.

Certificate shall be signed by manufacturer and/or Contractor certifying that material or equipment specified and installed conforms to or exceeds the requirements of the Specifications and has been inspected by an authorized field representative. Attach supporting reference data, affidavits and certifications as appropriate.

2.0 PRODUCTS (NOT USED)

3.0 EXECUTION (NOT USED)

4.0 APPENDICES

4.1 APPENDIX A - CERTIFICATE OF COMPLIANCE

Contract: No. 07-31 Chelan Tailrace Pump Station – Pump Procurement

Contractor: _____

Equipment/System: _____

The Manufacturer(s) and Fabricator(s) of materials and products incorporated into the Work and furnished as specified in the Contract Documents hereby certify that:

1. All materials and products incorporated into the Work provided by manufacturers and fabricators are as specified in the Contract Documents.
2. All materials and products incorporated into the Work provided by manufacturers and fabricators are in accordance with all codes, and standards as specified in the Contract Documents.
3. All materials and products incorporated into the Work provided by manufacturers and fabricators have been subjected to all material and/or factory tests specified in the Contract Documents, and that the results of those tests are within all limits and acceptance criteria as specified.
4. Copies of material certification and factory test results are attached.

Manufacturer/Fabricator Information	
Name of Manufacturer or Fabricator:	
Street Address:	
City/State/Zip:	
Phone Number:	
Authorized Representative:	
Name and Title:	
Signature/Date:	

Comments: _____

4.2 APPENDIX B - CERTIFICATE OF PROPER INSTALLATION

Contract No. 07-31 Chelan Tailrace Pump Station – Pump Procurement

Contractor: _____

Equipment/System: _____

The Manufacturer and Fabricator of materials and products incorporated into the Work and furnished as specified in the Contract Documents hereby certify that:

1. Authorized representative(s) have provided technical support during installation, alignment, functional and performance testing of all materials and products as specified in the Contract Documents.
2. Authorized representative(s) have performed final inspection of all materials and products as specified and that installation, alignment and operation of materials and products is in accordance with the Manufacturer/Fabricator.
3. Authorized representative(s) certify that installation of materials and products meet all Manufacturer/Fabricator requirements for proper installation.
4. Copies of documentation demonstrating proper installation are attached.

Manufacturer/Fabricator Information	
Name of Manufacturer or Fabricator:	
Street Address:	
City/State/Zip:	
Phone Number:	
Authorized Representative:	
Name and Title:	
Signature/Date:	

Comments: _____

END OF SECTION 01450

SECTION 01460

INSPECTIONS AND TESTS

TABLE OF CONTENTS

1.0	GENERAL	2
1.1	GENERAL REQUIREMENTS	2
1.2	REFERENCES, SPECIFICATIONS, CODES AND STANDARDS.....	2
2.0	TESTS	2
2.1	INSPECTION AND TEST PLANS	3
3.0	MEASUREMENT AND TEST EQUIPMENT.....	3
4.0	SHOP TESTS	3
4.1	GENERAL	3
4.2	SHOP TEST PROCEDURES	4
4.3	INSPECTION AND TEST DOCUMENTATION	4
5.0	FIELD TESTS	4
5.1	GENERAL	4
5.2	FIELD TEST PROCEDURES	5
5.3	FIELD TEST REPORTS	5
6.0	PRODUCTS (NOT USED)	6
7.0	EXECUTION (NOT USED)	6

SECTION 01460

INSPECTIONS AND TESTS

1.0 GENERAL

1.1 GENERAL REQUIREMENTS

All materials, products and components manufactured, procured or fabricated by Contractor as part of the Work shall be subjected to such tests and inspections as may be necessary to verify compliance with the requirements of the Contract Documents.

All expenses for the tests shall be fully borne by Contractor. Contractor shall prepare and provide all labor, material and equipment necessary for performing specified or required tests. Contractor shall submit the test results to Engineer for approval.

Inspections shall be performed in accordance with the approved Contractor Quality Control Plan. Inspection results shall be part of the quality documentation.

1.2 REFERENCES, SPECIFICATIONS, CODES AND STANDARDS

1. American National Standards Institute (ANSI).
2. Code of Federal Regulations (CFR).
3. National Institute of Standards and Technology (NIST).
4. See product data sheets.

2.0 TESTS

Contractor shall evaluate test results and advise Engineer immediately of any discrepancy between test results and test limits or the failure of any item to meet the test criteria.

Contractor shall protect all material and equipment during and after testing and checking to provide that subsequent testing of other equipment or systems does not disturb, damage, or otherwise interfere with functional capability of material and equipment.

In the event that test results do not fulfill the requirements specified in these Specifications or that any defects attributable to Contractor are found in test results, Contractor shall repair, adjust or correct and retest at its own expense to the satisfaction of Engineer. Repairs shall be subject to the approval of Engineer. Even in such an event, Contractor shall be responsible for maintaining the Project schedule and milestone completion dates.

2.1 INSPECTION AND TEST PLANS

Contractor shall submit for review and approval by the District, not later than 30 calendar days before the start of any work, an Inspection and Test Plan (ITP). The Inspection Elements – Summary Matrix submitted by the Contractor shall list all required Inspections and Tests for each definable feature of work, references to test methods, applicable standards and procedures, acceptance criteria, and results. The ITPs shall be revised as necessary if the planned tests change. Any changes to the ITPs shall be resubmitted for approval.

Separate ITPs shall be submitted for shop and field test programs. The ITPs shall include as a minimum:

1. Material test certificates
2. Visual inspections
3. Test Procedures
4. Test Personnel Qualifications
5. Inspection Elements - Summary Matrix

3.0 MEASUREMENT AND TEST EQUIPMENT

Measurement and test equipment (meters, gauges, torque wrenches, sensors, etc.) supplied or used by Contractor for taking or recording of data shall:

1. Have accuracy equal to or greater than stated acceptance criteria tolerances for test or work being performed.
2. Have current calibration with traceability to National Institute of Standards and Technology (NIST). Calibration records shall be maintained as required by ANSI/ASQC E2 and submitted if requested by Engineer.
3. Have traceability to national standards in the country of use, subject to approval by Engineer, where such equipment is supplied and used in facilities outside the United States.

4.0 SHOP TESTS

4.1 GENERAL

All materials, components, and assemblies shall be completely shop tested in accordance with the CQC Plan, Shop Inspection and Test Plan (ITP), and these Specifications. Contractor shall provide all procedures, equipment, materials, and labor for shop testing.

Contractor shall give full cooperation to District's inspection at the shop. During manufacture, Contractor shall request District's observation of those in-progress tests, which are impossible to be checked if the manufacture is advanced or completed.

Shop tests shall be performed by personnel experienced in the type of test being performed under the direct supervision of Contractor's Test Engineers.

4.2 SHOP TEST PROCEDURES

Contractor shall prepare and maintain complete detailed procedures for all shop inspections and tests. Tests and procedures identified in the specific equipment sections shall be prepared or translated to the English language and submitted for review and approval. Other procedures shall be available for inspection at Contractor's facilities and submitted upon request. Procedures shall include, as a minimum, the following:

1. Table of Contents
2. Purpose
3. Precautions
4. References
5. Test Equipment
6. Prerequisites
7. Step-by-Step Procedures
8. Acceptance Criteria
9. Data or Record Sheets
10. Drawings or Data, as applicable
11. Sign-off for Performance and Witness

Step-by-step procedures shall be in sufficient detail to perform the test without reference to documentation or information not contained in the procedure or the need for interpretation as to intent or methods.

4.3 INSPECTION AND TEST DOCUMENTATION

The results of all inspections and tests shall be fully documented. Results for tests identified in these Specifications shall be included in complete test reports and submitted to Engineer for review and approval. Approval of test results is a requirement for shipping release.

5.0 FIELD TESTS

5.1 GENERAL

All components and assemblies installed at site shall be completely tested in accordance with the CQC Plan, Field Inspection and Test Plan (ITP), Acceptance Test

Plan in Section 01460, and these Specifications. Contractor shall provide all procedures, oversight, and documentation for field testing.

Field tests shall be performed by personnel experienced in the type of test being performed.

5.2 FIELD TEST PROCEDURES

Contractor shall prepare and submit for review and approval field test procedures for all field tests. Procedures shall include, as a minimum, the following:

1. Table of Contents.
2. Purpose.
3. Precautions.
4. References.
5. Test Equipment.
6. Prerequisites.
7. Step-by-Step Procedures.
8. Acceptance Criteria.
9. Data or Record Sheets.
10. Drawings or Data, as applicable.
11. Sign-off for Performance and Witness.

Step-by-step procedures shall be in sufficient detail to perform the test without reference to documentation or information not contained in the procedure or the need for interpretation as to intent or methods.

5.3 FIELD TEST REPORTS

Within twenty-four (24) hours of completion of each field test, Contractor shall submit one (1) copy of the test results to Engineer, unless specified otherwise. After completion of all field tests for an assembly, Contractor shall furnish two (2) copies of a complete report of all field tests performed. The report shall include a description (at a minimum) of the following:

1. Item Tested
2. Test Instrumentation
3. List of Test Personnel
4. Calibrations of Measuring Equipment
5. Test Procedure
6. Tabulations of Measurements
7. Sample Calculations, as appropriate
8. Test Results, including final adjustments and settings
9. Conclusions and/or Remarks

To the fullest extent possible, all data gathered electronically shall be in a form easily imported to Microsoft Excel. District shall be furnished an electronic copy of all original and manipulated test data.

6.0 PRODUCTS (NOT USED)

7.0 EXECUTION (NOT USED)

END OF SECTION 01460

SECTION 01611

SEISMIC ANCHORAGE AND BRACING

TABLE OF CONTENTS

1.0	GENERAL	2
1.1	SECTION INCLUDES	2
1.2	REFERENCES	2
1.3	SUBMITTALS	2
1.4	DESIGN AND PERFORMANCE REQUIREMENTS.....	3
2.0	PRODUCTS.....	4
2.1	GENERAL	4
3.0	EXECUTION	4
3.1	GENERAL	4
3.2	INSTALLATION	5
3.3	FIELD QUALITY CONTROL	5

SECTION 01611

SEISMIC ANCHORAGE AND BRACING

1.0 GENERAL

1.1 SECTION INCLUDES

This section covers requirements for seismic anchorage and bracing for equipment and all nonstructural components required in accordance with Section 1621 of the International Building Code. The Contractor shall be responsible for designing all seismic attachments, braces, and anchors to the structure for all parts or elements of the architectural, mechanical, and electrical systems included in the Work in accordance with this section.

1.2 REFERENCES

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

1. American Society of Civil Engineers (ASCE): ASCE 7, Minimum Design Loads for Buildings and Other Structures.
2. International Code Council (ICC):
 - a. International Building Code (IBC).
 - b. Evaluation Service (ICC-ES) Reports and Legacy Reports.
3. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA): Seismic Restraint Manual: Guidelines for Mechanical Systems.

1.3 SUBMITTALS

1.3.1 Action Submittals

Shop Drawings and Seismic Anchorage and Bracing Calculations:

1. Submit a complete list of equipment to be anchored weighing 20 pounds or more.
2. Show details of complete seismic attachment assemblies including connection hardware, braces, and anchor bolts.
3. Submit applicable manufacturer's engineered seismic hardware data and installation requirements.
4. Provide calculations for all seismic attachments, braces, and anchorages clearly showing the criteria used for the design and sealed by a civil or structural engineer registered in the State of Washington.
5. Submit shop drawings with supporting calculations no less than 4 weeks in advance of installation of any component or equipment to be anchored to the structure.

1.4 DESIGN AND PERFORMANCE REQUIREMENTS

In accordance with IBC Section 1621, all architectural, mechanical, electrical and other non-structural systems, components, and elements permanently attached to the structure shall be designed and constructed to transfer the component seismic forces specified in ASCE 7, Section 9.6.1 to the structure. Seismic anchorage and bracing systems shall be designed by a professional engineer registered in the State of Washington.

Architectural components shall include, but not be limited to, nonstructural walls and elements, partitions, cladding and veneer and cabinets.

Seismic attachments, braces, and anchorages for all parts or elements of the architectural, mechanical, and electrical systems shall be designed in accordance with the provisions of the International Building Code and the following site-specific seismic criteria unless noted otherwise on the Drawings.

1. Site-Specific Spectral Response Coefficients:
 - a. Short Period Mapped Maximum Considered Earthquake, 5 Percent Damped: S_s equals 0.51g.
 - b. 1 Second Period Mapped Maximum Considered Earthquake, 5 Percent Damped: S_1 equals 0.17g.
 - c. Short Period Design Spectral Response Acceleration, 5 Percent Damped: S_{DS} equals 0.34g.
 - d. 1 Second Period Design Spectral Response Acceleration, 5 Percent Damped: S_{D1} equals 0.11g.
2. Site Class: B.
3. Seismic Design Category: C, unless noted otherwise. The Seismic Design Category shall be the same as the structure to which the nonstructural components are attached, as designated on the Drawings.
4. Building Classification II, Seismic Use Group I; unless noted otherwise. The Seismic Use Group shall be the same as that for the structure to which the nonstructural components are attached.
5. Component Importance Factor, I_p : 1.0, unless noted otherwise.

In accordance with ASCE 7, the following are exempt from the requirements of the section for provision of seismic anchorages and bracing:

1. Mechanical and electrical components with I_p equals 1.0 that weigh 400 pounds or less, are mounted 4 feet or less above the adjacent finished floor elevation, and are provided with flexible connections between the components and any associated ductwork, piping, or conduit.

2. Mechanical and electrical components with I_p equals 1.0 that weigh 20 pounds or less, are mounted at any height, and are provided with flexible connections to attached ductwork, piping, and conduit.
3. Distribution systems weighing 5 pounds per foot or less.

2.0 PRODUCTS

2.1 GENERAL

Attachments and supports transferring seismic loads to the structure will be constructed of materials and products suitable for the application and designed and constructed in accordance with the design criteria shown on the Drawings and nationally recognized standards. The seismic attachments, braces, and anchorages will be provided and installed by the Contractor.

Materials: Section 05500, Metal Fabrications and Castings. Source quality control shall be in accordance with the referenced section.

Powder driven fasteners and sleeve anchors shall not be used for seismic attachments and anchorage where resistance to tension loads is required.

3.0 EXECUTION

3.1 GENERAL

The Contractor shall design the seismic attachments, braces, and anchorage to the structure of all architectural, mechanical, and electrical system elements whether or not attachment, bracing, or anchorage of the specific item is called for in any specification section or on the Drawings. Seismic attachments, bracing, and anchorage shall be made in such a manner that the component seismic force is transferred to the lateral force resisting system of the structure through a complete load path.

The overall seismic anchorage system shall provide restraint in all directions, including vertical, for each component or system so anchored.

Components mounted on vibration isolation systems shall have snubbers in each horizontal direction and vertical restraints where required to resist overturning.

Piping shall be anchored in such a manner as to ensure that the piping system has adequate flexibility and expansion capabilities at flexible connections and expansion joints. All piping and ductwork suspended more than 12 inches below the supporting structure shall be braced for seismic effects.

Tall and narrow equipment such as motor control centers and telemetry equipment shall be anchored at the base and within 12 inches from the top of the equipment, unless approved otherwise by the Engineer.

Architectural, mechanical, or electrical components shall not be attached to the more than one element of a building structure at a single restraint location where such elements may respond differently during a seismic event. Such attachments shall also not be made across building expansion and contraction joints.

Seismic attachments and braces will be provided and installed by the Contractor in accordance with Section 05500, Metal Fabrications and Castings. Attachment requirements and size and number of braces will be based on the calculations submitted by the Contractor.

Anchor bolts and concrete anchors for the anchorage of equipment will be provided and installed by the Contractor in accordance with Section 05500, Metal Fabrications and Castings. Size of anchor bolts and anchors and required minimum embedment and spacing will be based on the calculations submitted by the Contractor.

Details of and calculations for all seismic anchorages shall be submitted and accepted as specified within this Section. Submittals will be rejected if the proposed anchorage method would create an overstressed condition of the supporting member. The Contractor shall be responsible for revisions to the anchorages and/or strengthening of the structural support so that there is no overstressed condition at no additional cost to the Owner.

3.2 INSTALLATION

The Contractor shall not install any seismic anchorages or restraints prior to review and acceptance by the Engineer.

3.3 FIELD QUALITY CONTROL

Field Quality Control shall be in accordance with Section 05500, Metal Fabrications and Castings.

END OF SECTION 01611

SECTION 01660

SPECIAL SERVICES

TABLE OF CONTENTS

1.0	GENERAL	2
1.1	SCOPE OF WORK.....	2
1.2	QUALITY ASSURANCE.....	2
1.3	SUBMITTALS	2
1.4	SAFETY	2
2.0	PRODUCTS.....	3
2.1	GENERAL	3
3.0	EXECUTION.....	3
3.1	INSTALLATION	3
3.2	PREOPERATIONAL TESTS	3
3.3	FIELD OPERATIONAL TESTS	3

SECTION 01660

SPECIAL SERVICES

1.0 GENERAL

1.1 SCOPE OF WORK

The Contractor's designated installation supervisor representative shall supervise installation, startup, commissioning, and performance tests of the equipment furnished under this Contract and for any adjustments to the equipment as necessary and described in this Specification.

The Contractor's representative shall be able to clearly express himself in the technical/conversational English language.

1.2 QUALITY ASSURANCE

The term manufacturer or any reference thereto shall pertain to the supplier responsible for the design and manufacture of components of the pumps and other equipment provided under this Contract.

The Contractor shall provide information to verify that Contractor's designated installation supervisor has at least 5 years of experience in installation and startup of major pumping equipment.

1.3 SUBMITTALS

General: Submit all items in accordance with Section 01300, Administrative Requirements.

The Contractor shall submit installation procedures that shall describe the sequence of operations and the methods to be used for installation; the tolerances on alignment, and other dimensions wherever they are critical.

The Contractor shall submit a testing procedure to the Engineer for his review. Included as a part of this procedure shall be a complete list of all electrical instruments, mechanical equipment, and inspection tools that will be required during installation, covering preoperational and acceptance testing.

1.4 SAFETY

The Contractor's representative shall comply with all applicable ordinances and regulations including, but not limited to, federal, state, and municipal laws that are in force in the locality of the Work.

2.0 PRODUCTS

2.1 GENERAL

The equipment to be installed and tested is specified in other sections of these Specifications.

3.0 EXECUTION

3.1 INSTALLATION

The Contractor's installation supervisor shall be onsite throughout the installation of the equipment to advise the Engineer and the Owner's representatives and supervise the work performed by others. This work performed by others shall include installation, alignment, and electrical interconnection.

3.2 PREOPERATIONAL TESTS

The Contractor's installation supervisor shall be onsite throughout the preoperational testing of the equipment to advise the Engineer's and the Owner's representatives and supervise the work performed by others. This work performed by others shall include alignment checks, vibration and electrical installation field testing, operation of pumps, instrumentation testing (excluding calibration), and operational testing.

3.3 FIELD OPERATIONAL TESTS

The Contractor's installation supervisor shall be onsite to supervise the field operational testing of the equipment. All operational tests will be performed by others, excluding testing of the control system applications software.

END OF SECTION 01660

SECTION 01661

OPERATIONAL ACCEPTANCE TESTING

TABLE OF CONTENTS

1.0	GENERAL	2
1.1	SCOPE OF WORK.....	2
1.2	REFERENCES	2
1.3	RELATED WORK	2
1.4	ACCEPTANCE TEST PLAN	2
1.5	PROTECTION AND SAFETY	3
1.6	SUBMITTALS	3
1.7	SAFETY.....	3
2.0	PRODUCTS (NOT USED)	3
3.0	EXECUTION.....	3
3.1	GENERAL	3
3.2	ACCEPTANCE TESTS	4

SECTION 01661

OPERATIONAL ACCEPTANCE TESTING

1.0 GENERAL

1.1 SCOPE OF WORK

The Contractor shall prepare test plans and supervise all acceptance tests of its equipment. Acceptance tests shall be the basis for District's acceptance of the Work, including the operational pumps, electrical equipment, controls, and all accessory items in this Contract.

1.2 REFERENCES

These Specifications.

Manufacturer's Recommendations.

Testing Standards of Institute of Electrical and Electronics Engineers (IEEE).

Testing Standards of American National Standards Institute (ANSI).

National Electrical Code (NEC).

Testing Standards of ASTM International (ASTM).

National Electrical Manufacturers Association (NEMA).

Acceptance Standards of the National Electrical Testing Association (NETA).

1.3 RELATED WORK

Section 01460, Inspections and Tests.

1.4 ACCEPTANCE TEST PLAN

Acceptance tests will be conducted to determine whether the Contractor has fulfilled the requirements of the Specifications and the equipment is ready for operation by the District. The Contractor's representative shall supervise the acceptance tests.

Prepare plan for energization of electrical equipment, startup and testing of pumping equipment. Formulate complete energization procedures for all equipment furnished by Contractor. Procedures shall be complete and shall be prepared to accommodate the operating requirements of the pump station.

1.5 PROTECTION AND SAFETY

Assume total responsibility for damage to equipment material, and power system, due to improper test procedures or test apparatus. Replace or restore to original conditions the damaged equipment, material, or system.

1.6 SUBMITTALS

General: Submit startup procedures and acceptance test plan in accordance with Section 01300, Administrative Requirements as part of the Field Inspection and Test Plan, Section 01460, Inspections and Tests, that shall describe the sequence of checks, tests, acceptance criteria, and trial operation of the pump station equipment.

Submit acceptance test report, including test data sheets with Contractor representative's signature or initials, confirming Contractor's witness and agreement that test results meet the stated acceptance criteria.

1.7 SAFETY

The Contractor's representative shall comply with all applicable ordinances and regulations including, but not limited to, federal, state, and municipal laws that are in force in the locality of the Work.

2.0 PRODUCTS (NOT USED)

3.0 EXECUTION

3.1 GENERAL

Supervise functional and acceptance tests to ensure proper operation of equipment and proper calibration and coordination of protective devices.

Furnish and set up all special equipment required for these tests. Furnish drawings, documentation, test procedures, test instruments, and witness tests and checking of equipment.

Test instruments used for qualitative data shall have accuracy greater than or equal to stated acceptance criteria of the test being performed. Test instrument calibration records shall be supplied. Calibration of test instruments shall be traceable to National Bureau of Standards.

Supervise completion of all tests to verify that the equipment meets the specification requirements and that the equipment and devices operate as intended.

Evaluate the test results and advise District immediately of any discrepancy between test result and test acceptance criteria or the failure of any device or system under test as compared to the Contractor's Bid proposal and these specifications. Include test limits for acceptability applicable to each test on the certified test records.

Record test information, including the evaluation of testing results, on forms approved by District.

3.2 ACCEPTANCE TESTS

3.2.1 General

Prior to the start of acceptance testing, confirm that individual equipment testing specified in respective technical section has been successfully performed by the Installation Contractor and documentary evidence thereof submitted to the District.

Ensure all equipment have been properly installed, adjusted, connected, thoroughly cleaned, and touchup-painted.

Confirm that checks for continuity of circuits and for shorts and grounds, checks for tightness, and accurate connection of all cables, buses, and conductors have all been performed.

Check and verify all mechanical alignment and electrical clearances of moving parts.

Verify that the main electrical power feeder has been properly installed and checked for operation. Verify with the District that the power feeder is ready for energization and all protective relaying circuits have been calibrated and are functional.

3.2.2 Oil-Filled Pad Mounted Transformer

Check physical and mechanical operation of fused disconnect switches, circuit breakers and tap changers.

Verify that fuse sizes and types are correct. Verify that transformer has been properly secured and seismic anchorage is properly installed.

Supervise the test operation of equipment to ensure power feed is properly managed and protected.

Ensure all protective circuits are calibrated and functioning correctly.

Check for enclosure integrity and it is properly protecting equipment as intended.

3.2.3 Motor Control Circuits

Operate each motor circuit to verify motors rotate in correct direction.

Simulate fault conditions and verify control circuit correctly responds to activate motor protective functions, including main breaker shutdown.

Verify that all metering circuits are functional.

Verify that all communication circuits are functional.

3.2.4 Automatic Transfer Switch

Test to Ensure Correct:

1. Operation of individual components.
2. Sequence of operation.
3. Transfer time, voltage, frequency, and time delay settings.

Install in accordance with manufacturer's instructions.

3.2.5 Pumps

Each pump shall be tested to confirm successful start, stop and emergency stop functions. This test shall include starting and stopping each pump manually from the Motor Control Center (MCC) and then manually from the Programmable Logic Controller (PLC) control panel.

Each pump shall be test operated continuously in its final location for 48 hours, with all voltage, current, temperature, moisture and other monitored conditions recorded on a 2-hour interval. No increase in temperatures or motor currents will be acceptable in the final 12 hours of this test period. No alarm operations for the pump will be acceptable in any part of this 48-hour test.

3.2.6 Pump Control System

Pump control system shall be operated in all functional settings, including manual operation from the PLC, automatic operation to match a given flow setpoint. Test shall include a system startup, with staggered pump starts and all shutdown sequences as specified in Section 16700, Pump Control Panel.

Proper operation of all alarm circuits for all pump protective circuits shall be tested for all pump locations.

Verify correct display functions and correctness of information shown.

3.2.7 Canal Flow Meter

The Pumps shall be tested for flow performance in comparison to an Owner-provided canal flow meter. The canal flow meter shall be a level/velocity profiling style flow meter model H-ADFM as manufactured by ISCO.

3.2.8 Pre-Engineered Building

Perform thorough check to ensure building structure is properly erected, anchored and all accessories, doors, windows, HVAC, lighting, and other features are functional.

Confirm building is weathertight, the roof does not leak and window and door seals are functional.

Ensure internal equipment has been properly anchored and electrical clearances and grounding requirements have been met per the NEC.

All conduit and cable entrances shall be properly sealed for moisture, smoke and fire penetration.

Bus ducts and conduits connected to the building shall have been supported and anchored to comply with the NEC and for site operating conditions, whichever is more stringent.

END OF SECTION 01661

SECTION 01700

PACKAGING, SHIPPING, DELIVERY, AND STORAGE

TABLE OF CONTENTS

1.0	REFERENCES, SPECIFICATIONS, CODES AND STANDARDS.....	2
1.1	REFERENCES	2
2.0	PACKAGING, SHIPPING AND DELIVERY	2
2.1	PACKAGING	2
2.2	PACKING LIST	3
2.3	TRANSPORTATION	3
2.4	SHIPPING RELEASE	4
2.5	FINAL INSPECTION AND CHECK OF RECORDS	4
3.0	SHIPPING AND HANDLING	4
3.1	DELIVERIES	4
3.2	ON-SITE MATERIAL HANDLING	5
4.0	STORAGE AND PROTECTION	5
5.0	APPENDIX A – SHIPPING RELEASE	6

SECTION 01700

PACKAGING, SHIPPING, DELIVERY, AND STORAGE

1.0 REFERENCES, SPECIFICATIONS, CODES AND STANDARDS

1.1 REFERENCES

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

1. ASTM International (ASTM): D3951, Standard Practice for Commercial Packaging.

2.0 PACKAGING, SHIPPING AND DELIVERY

2.1 PACKAGING

Equipment shall not be prepared for shipment until it has been inspected and accepted for shipment at origin by the Engineer, or the District's agents or designees, unless inspection has been waived in writing.

Materials and equipment provided shall be suitably packed for shipment and storage including protection from dirt, moisture, weather, and damage. Due to site storage limitations, some materials may need to be stored outdoors. The District will designate laydown and storage areas available for Contractor's use for site storage of materials and equipment for this Contract. Contractor shall provide all protective covers, housings, and materials for storage.

1. Packaging shall prevent the entrance of rodents and insects. Silica gel or other desiccant shall be provided to keep the internal parts dry. Provisions shall be provided for easy access for desiccant replacement.
2. A direct reading hydrometer shall be provided to indicate relative humidity for materials where humidity may cause damage.
3. Hydraulic cylinders and like components that are filled with oil during operation and have no other internal corrosion protection shall be shipped filled with oil.
4. Space heaters shall be provided for packaging where needed. Space heaters shall be designed for a 120 Vac, single phase; or 460 Vac, 3-phase, 60 Hz power source. All electrical and electronic cubicles shall have heaters for storage.

Contractor shall be responsible for all materials requiring special storage and handling including controlling temperature, humidity, dust or any other atmospheric conditions. Standard commercial packaging in accordance with ASTM D3951 will be acceptable except where a different method or more stringent method is required.

Packaging shall have points of lift identified with "Lift Here" marked in appropriate locations. Packages with a total weight greater than 75 pounds shall be marked with the package weight. Packages containing hazardous materials shall have "hazardous" marked on the package and shall have the proper Material Safety Data Sheets (MSDS), and instructions for safe handling and storage. Items which have a limited storage life, such as epoxy resins, shall ship immediately before use.

The spare parts shall be packed separately from other articles.

Subassemblies shall be provided with adequate protective pads, supports, and blocking and shall be securely restrained to prevent distortion or damage in transit.

2.2 PACKING LIST

Contractor shall provide a complete bill of materials, packing list, and schedule of shipment and delivery for all shipments. The initial lists shall be provided no later than thirty (30) days prior to the first shipment. The list shall be updated as necessary prior to each shipment. The final list shall include identification of items packed in each crate or container, storage requirements (including power, if any), and individual and total container weight.

A packing list shall be:

1. Attached to each shipment listing the contents of each container.
2. Placed in a moisture-proof envelope.
3. Securely fastened to the outside of the container.

Due to security restrictions on site, crates, or containers without complete packing lists, sufficient to identify all material shipped, will not be permitted on site.

2.3 TRANSPORTATION

Contractor shall bear all costs of loading, permitting, transporting, duties, fees, taxes, unloading and handling for all required materials from Contractor's shipping point or points, to the Site. Contractor shall also bear all costs of transporting test instruments and equipment to and from the job site.

Contractor shall prepare all shipping and customs documentation and pay all shipping charges. Contractor shall accept responsibility, for all loss or damage incurred during shipment, unloading, and storage regardless of nature or cause (including damage to the painted surfaces). Contractor shall receive materials and packages on site, unload, and store them.

Shipments shall be made FOB to the Lake Chelan Hydroelectric Project with access from Chelan County, approximately thirty-two (32) miles north of Wenatchee, Washington.

District and Engineer shall be notified a minimum of fifteen (15) days prior to actual shipping dates of any equipment, the equipment to be shipped, the method of transport, the carriers and routing, the shipping and delivery dates, and the approximate shipping weights.

2.4 SHIPPING RELEASE

No shipments shall be made without inspection and/or written release from District. Contractor shall request release for shipment with submittal of all required shipping and inspection documentation. When shipment is actually made, transmit shipping notices to the Engineer on each shipment, including a description of the equipment being shipped.

For each shipment, submit "Shipping Release" form, Appendix A at the end of this section. Accompany each shipment with a packing list of all equipment included in the shipment, including weights.

Materials manufactured to documents that:

1. have not been submitted for review by Engineer;
2. have been returned marked "Not Approved," or;
3. have been marked "Approved as Revised" without resolution of comments; shall not be shipped without prior approval, as specified.

These requirements also apply to shipments from Contractor's Subcontractors, when item(s) are to be shipped directly to the jobsite.

2.5 FINAL INSPECTION AND CHECK OF RECORDS

Contractor shall be responsible for inspecting the item(s) and checking the applicable records, prior to shipment, to verify that all items comply with the Specification requirements.

3.0 SHIPPING AND HANDLING

3.1 DELIVERIES

Delivery schedules shall be controlled to minimize long-term storage of products at the Site and overcrowding of construction spaces. In particular, the Contractor shall ensure

coordination to ensure minimum holding or storage times for flammable, hazardous, easily damaged, or sensitive materials to deterioration, theft, and other sources of loss. All freight deliveries directly to the project site shall be made between the hours of 7:30 a.m. and 3:00 p.m. PST/PDT Monday through Friday.

Contractor shall notify District forty-eight (48) hours in advance of freight deliveries for security inspection and coordination purposes. Equipment shall not be accepted as delivered until inspected by the District.

3.2 ON-SITE MATERIAL HANDLING

1. Clearly mark each item, case, crate, or bundle with the Project name and bid number.
2. Transport and handle material and equipment in accordance with manufacturer's instructions.
3. Provide equipment and personnel to handle material and equipment on site by methods to prevent soiling, disfigurement, or damage.
4. Promptly inspect shipments to assure that material and equipment comply with requirements, quantities are correct, and material and equipment are undamaged.
5. Repair or replace equipment or materials damaged in shipment.
6. Plainly mark for identification any articles or materials that might be otherwise lost. Box or steel band in bundles any such articles or materials.
7. Clearly show the weights of components that exceed seventy-five (75) pounds and require the use of forklifts, cranes, or other equipment for safe handling. Provide suitable provisions for handling material for weight and size considerations.

4.0 STORAGE AND PROTECTION

Outdoor storage space is available at the site, and will be made available to the Contractor.

Contractor shall be responsible for the security, safety, condition of materials in storage, and handling and moving materials and parts from storage to assembly areas and the powerhouse.

1. Store and protect material and equipment in accordance with manufacturer's instructions, with seals and labels intact and legible. Store moisture or temperature sensitive material and equipment in weather tight or climate-controlled enclosures.
2. Provide for off-site storage and protection when site does not permit on-site storage or protection.

3. Cover material and equipment subject to deterioration with impervious sheet covering. Furnish ventilation to avoid condensation or potential degradation of material and equipment.
4. Provide equipment and personnel to store material and equipment by methods to prevent soiling, disfigurement, or damage.
5. The Contractor shall ensure that surfaces of products exposed to the elements are not adversely affected and that weathering of finishes does not occur.
6. Arrange storage of material and equipment to permit access for maintenance and inspection of stored items.
7. Periodically inspect to assure material and equipment is undamaged and is maintained in acceptable conditions.
8. After receipt of material and equipment, assume responsibility for loss and damage, including but not limited to breakage, corrosion, weather damage, and distortion.

Notify District and Engineer in writing upon acceptance of shipment, in accordance with Section 01300.

5.0 APPENDIX A – SHIPPING RELEASE

(The remainder of this page has been intentionally left blank).

APPENDIX A - SHIPPING RELEASE

Contractor:			
Supplier:			
Supplier's Location:			
Item Released:			
Drawing No:		Mark No:	
All QA/QC Documentation Complete:	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Reason:
District Notified:	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Reason:
Copy of Packing List Attached	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Reason:
Carrier:		Way Bill No	
Anticipated Ship Date:		Anticipated Arrival Date:	
Remarks:			
The undersigned certify that the above parts and materials meet all applicable parts of the Specifications, Drawings, and Contract.			
Supplier:		Date:	
Contractor:		Date:	
Released for shipping:			
District (or designee):		Date:	

This shipping release does not constitute acceptance by District and does not release Contractor or the supplier from their obligations under the Contract.

END OF SECTION 01700

SECTION 01760

SPARE PARTS AND MAINTENANCE MATERIALS

TABLE OF CONTENTS

1.0	DESCRIPTION	2
2.0	PACKAGING	2

SECTION 01760

SPARE PARTS AND MAINTENANCE MATERIALS

1.0 DESCRIPTION

1. Furnish a list of recommended additional spare parts that are suggested by the Contractor, in addition to those specifically listed herein. Provide this list as a shop drawing. Provide a price list for these spare parts as specified in Section D, Supplemental Conditions.
2. Furnish spare parts specified herein, unless otherwise approved by Engineer.
3. Spare parts shall be new and of the same design, materials, manufacture, quality, and have the same ratings and be interchangeable with the original materials and parts provided. All parts and materials shall be designed for installation by District personnel.
4. Furnish "additional" spare parts, as recommended by Contractor in its bid and/or after final design of equipment, if approved by Engineer.
5. The Contractor shall furnish all special wrenches, tools, templates, and handling devices for convenient and expeditious installation, assembly, and disassembly of the supplied equipment.

2.0 PACKAGING

Packages of spare parts and tools shall carry notation (which clearly indicates that the contents are spare parts), shall be accompanied by a list of contents, and directions for proper storage.

Spare parts and tools shall be labeled, packed in suitable containers, and crated firmly enough to withstand storage for a minimum of ten (10) years. Those items in need of rust preventive treatment shall be so treated.

Place all mechanical and electrical parts subject to damage from moisture in hermetically sealed metal containers, in plastic envelopes, or other approved container within their respective packing cases. Provide suitable desiccant in all sealed containers.

Packaging, shipping, and delivery of spare parts shall be in accordance with Section 01700.

An inventory for spare parts and materials shall be submitted for review. Each spare part item shall be accompanied by a completed "Request for Inventory Item" form (provided by District). Contractor shall complete the form:

1. One (1) copy shall be submitted to Engineer at the time of shipment and,
2. One (1) copy shall accompany the shipment.

Contractor shall submit corrected Spare Parts list, when designs are completed and spare part details are determined.

END OF SECTION 01760

SECTION 05050

WELDING

TABLE OF CONTENTS

1.0	GENERAL	2
1.1	REFERENCES	2
1.2	DEFINITIONS	2
1.3	SCOPE	3
1.4	SUBMITTALS	3
2.0	QUALITY ASSURANCE	4
3.0	DELIVERY, STORAGE, AND HANDLING	4
3.1	GENERAL	4
4.0	WELDING	4
4.1	GENERAL	4
4.2	TACK WELDS	5
4.3	EXAMINATION OF WELDS	5
4.4	SURFACE FINISH OF WELDS	7
5.0	BRAZING	8
5.1	GENERAL	8
5.2	BRAZING PROCEDURES	8
5.3	QUALIFICATION OF BRAZERS	8
5.4	BRAZING SHOWN ON DRAWINGS	9

SECTION 05050

WELDING

1.0 GENERAL

1.1 REFERENCES

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

1. American Society for Nondestructive Testing (ASNT):
 - a. ASNT SNT-TC-1A, Personnel Qualification and Certification in Nondestructive Testing.
2. American Society of Mechanical Engineers (ASME):
 - a. BPVC, Section V, Nondestructive Examination.
 - b. BPVC, Section VIII, Division 1, Rules for Construction of Pressure Vessels.
 - c. BPVC, Section IX, Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators.
 - d. B31.1, Power Piping.
 - e. B31.3, Process Piping.
3. American Welding Society (AWS):
 - a. A2.4, Standard Symbols for Welding, Brazing, and Nondestructive Examination.
 - b. A3.0, Standard Welding Terms and Definitions; Including Terms for Adhesive Bonding, Brazing, Soldering, Thermal Cutting and Thermalspraying.
 - c. D1.1, Structural Welding Code – Steel.
 - d. D14.4, Specification for Welded Joints in Machinery and Equipment.
 - e. QC1, Standard for AWS Certification of Welding Inspectors.

1.2 DEFINITIONS

CJP: Complete Joint Penetration

CWI: Certified Welding Inspector

MT: Magnetic Particle Testing

NDE: Nondestructive Examination

NDT: Nondestructive Testing

PJP: Partial Joint Penetration

PQR: Procedure Qualification Record

PT: Liquid Penetrant Testing

RT: Radiographic Testing

UT: Ultrasonic Testing

VT: Visual Testing

WPQ: Welder/Welding Operator Performance Qualification

WPS: Welding Procedure Specification

1.3 SCOPE

1.3.1 General welding requirements for all portions of the project for shop welding are specified in this section. Other requirements are specified in other Specification sections or shown on the Drawings.

1.4 SUBMITTALS

Submit the following in accordance with Section 01300, Administrative Requirements.

1.4.1 Welding Data (Shop and Field)

1. Show on a weld map complete information regarding base metal specification designation, location, type, size, and extent of welds with reference called out for WPS and NDE numbers in tail of welding symbol.
2. Clearly distinguish between shop and field welds.
3. Indicate, by welding symbols or sketches, details of welded joints and preparation of base metal. Provide complete joint welding details showing bevels, groove angles, and root openings for welds.
4. Welding and NDE symbols shall be in accordance with AWS A2.4.
5. Welding terms and definitions shall be in accordance with AWS A3.0.
6. Submit welding data together with shop drawings as a complete package a minimum of 10 calendar days prior to welding operations.

1.4.1.2 Welding Procedures and Procedure Qualifications

Welding procedures (WPSs) and procedure qualifications (PQRs), a minimum of 30 calendar days prior to the work. Welding procedures shall be in accordance with AWS D1.1/D1.1M (Annex E Forms) or ASME BPVC SEC IX (Forms QW-482 and QW-483).

1.4.1.3 Qualification of Welders

All shop welder and welding operator performance qualifications records (WPQRs) shall be submitted to the Engineer for review a minimum of 30 calendar days prior to the work. Performance qualifications shall be submitted on appropriate forms and shall be in accordance with AWS D1.1/D1.1M (Annex E Forms) or ASME BPVC SEC IX (Form QW-484).

1.4.1.4 Non-Destructive Test Procedures

NDT procedure specifications shall be prepared in accordance with ASME BPVC Section V. Submit a minimum of 30 calendar days prior to NDT testing.

1.4.2 Statements

1.4.2.1 Certification of Welding Inspectors

Certification of welding inspectors, a minimum of 30 calendar days prior to their performance of work. Inspectors shall be CWI certified in accordance with AWS QC 1, and have prior experience with the welding codes specified

1.4.2.2 Testing Agency Personnel Credentials

Personnel performing tests shall be NDT Level II Certified in accordance with ASNT SNT-TC-1A. Submit credentials a minimum of 30 calendar days prior to NDT testing.

2.0 QUALITY ASSURANCE

Welding inspectors in the shop shall keep a notebook(s) with current and complete records of all submitted information and records pertinent to welding on the project including, but not limited to WPSs, WPQRs, NDT results, inspection reports and all records of repair. This notebook(s) shall be available to the Engineer at all times.

3.0 DELIVERY, STORAGE, AND HANDLING

3.1 GENERAL

Products shall be as specified in the governing welding codes referenced. All filler metals, electrodes, fluxes, and other welding/brazing materials shall be delivered to the site in manufacturers' original packages and stored in a dry space until used. Packages shall be properly labeled and designed to give maximum protection from moisture and to insure safe handling. SMAW electrodes shall be handled, stored and conditioned as outlined in AWS D1.1.

4.0 WELDING

4.1 GENERAL

All welding, welded joints and structures fabricated by welding shall be in accordance with the applicable welding code requirements and additional requirements, as specified below. Contractor shall ensure that suppliers comply with these requirements as they apply to the equipment being manufactured. Deviations from applicable codes, approved procedures, and approved detail drawings will not be permitted without prior written District approval. Procedure shall be developed by Contractor for welding all metals included in the Work. Welding operations shall not commence until welding

procedures, welders, and welding operators have been qualified in accordance with the applicable welding code.

Selection of welding processes and development of weld procedures is part of the design process established by Contractor which shall take into account the stress levels and use of the specific component. It is the responsibility of Contractor to ensure that welded joints are designed and sized in accordance with the most advanced engineering standards and practices for each class of equipment.

Structural and non-structural welds shall be designed, produced, qualified, inspected and repaired in accordance with AWS D1.1 or ASME BPV Section VIII, Division 1. Process piping and related welds shall be designed, produced, qualified, inspected and repaired in accordance with ASME B31.1 or ASME B31.3, as appropriate.

All welded components and assemblies, which are to be machined, shall be stress relieved prior to final machining. The stress relief shall be performed in accordance with the requirements of the applicable welding code referenced above.

Peening shall not be used unless specifically approved by Engineer. Welding shall only be done on materials above 50°F on dry surfaces. Short circuiting arc GMAW is prohibited.

4.2 TACK WELDS

Tack welds that are to be incorporated into the permanent work shall be subject to the same quality and qualification requirements as the permanent welds. Preheating shall be performed as specified for permanent welds. Such tack welds shall be cleaned and fused thoroughly with the permanent welds. Multi-pass tack welds shall have cascaded ends. Defective tack welds shall be removed before permanent welding.

4.3 EXAMINATION OF WELDS

4.3.1 General

The CWI shall perform inspection prior to assembly, during assembly, during welding, and after welding to ensure material and workmanship meet the requirements specified. In addition to visual inspection, all welds on weld-fabricated parts shall be given complete nondestructive examination. Supplemental radiographic examination shall include examination of critical high-stressed areas where interpretations of other methods are unclear, or where the integrity of the weld is doubtful.

The nondestructive standards of welds shall be clearly indicated on the Drawings. Contractor shall submit all NDE records to District as requested.

Contractor shall perform, as a minimum, the following weld examinations at Contractor's expense.

Weld Type	Test Type
Fillet and PJP Groove welds	20% random MT or PT
CJP Butt Joint welds	20% random RT
CJP Groove welds	10% random RT or 10% random UT
All welds	100% VT

4.3.2 District Quality Assurance

All welds shall be subject to inspection by District. District may require that coupons be cut from any location in any joint when doubt as to soundness can not be resolved by non-destructive inspection.

The District reserves the right to hire a 3rd party inspection agency to perform a radiographic inspection on any weld. If defects are located as a result of the radiographic inspection, Contractor shall pay for all costs associated with the repairs and the radiographic inspection. Acceptance criteria shall be as listed below.

4.3.2.1 Visual Examination (VT)

Prior to the use of any material, it shall be thoroughly visually examined to determine its suitability for use. All completed welds shall be cleaned and examined carefully for insufficient throat or leg sizes, cracks, undercutting, overlap, excessive convexity or reinforcement, contour and finish and other surface defects.

Acceptance Criteria:

1. Structural Pipe and Tubing: AWS D1.1/D1.1M, Paragraph 6.9, Visual Inspection, Tubular Connections.
2. All Other Structural Steel: AWS D1.1/D1.1M, Paragraph 6.9, Visual Inspection, Statically Loaded Nontubular Connections.

Defects shall be corrected or repaired as provided in the respective section of ASME Section VIII, IX or AWS D1.1, Section 5.26. The individual performing the VT tests shall be an AWS certified welding inspector (CWI) with a minimum of 2 years experience within the last 3 years.

4.3.2.2 Liquid Penetrant Inspection (PT)

The penetrant tests and inspection shall conform to the requirements of Appendix 8, Section VIII of the ASME Code, except that penetration time is 15 minutes minimum below 50°F. All indications exceeding the acceptance standards permitted by Appendix 8 of the ASME Code shall be repaired and reinspected per Appendix 8, at Contractor's

expense. The individual performing the PT tests shall, as a minimum, be ASNT-TC-1A Level 2 qualified, with a minimum of one (1) year of current experience at this level.

4.3.2.3 Magnetic Particle Inspection (MT)

The magnetic particle tests and inspection shall conform to the requirements of Appendix 6, Section VIII of the ASME Code. All indications exceeding the acceptance standards permitted by Appendix 6 of the ASME Code shall be repaired and reinspected per Appendix 6, at Contractor's expense. The individual performing the MT tests shall, as a minimum, be ASNT-TC-1A Level 2 qualified, with a minimum of one (1) year of current experience at this level.

4.3.2.4 Ultrasonic Inspection (UT)

The services of an independent party shall be employed to ultrasonically test (UT) as specified herein. The individual performing the work shall, as a minimum, be ASNT-TC-1A Level 3 qualified, or Level 2 qualified with three (3) years of current experience at this level. Appropriate test blocks simulating the material to be tested shall be prepared for equipment calibration. Appropriate test heads shall be prepared and used with the ultrasonic equipment. The ultrasonic tests and inspection shall conform to the requirements of Appendix 12, Section VIII of the ASME Code. All indications exceeding the acceptance standards permitted by Appendix 12 of the ASME Code shall be repaired and reinspected per Appendix 12, at Contractor's expense. A certified written report by the independent party shall be prepared and submitted to District. The report shall set forth the UT procedures used, equipment used, a mapping of the areas tested and interpretation of results, specifically addressing lack of bond or fusion, cracks, voids, and slag, the size and description of surface discontinuities and their accumulated total surface area relative to the inspected surface area, and the size and description of subsurface discontinuities.

4.3.2.5 Radiographic Examination (RT)

The services of an independent party shall be employed to radiographically test (RT) as specified herein. The individual performing the work shall, as a minimum, be ASNT-TC-1A Level 2 qualified with three (3) years of current experience at this level. The examination and acceptance criteria shall be in accordance with UW-51, Section VIII of the ASME Code.

4.4 SURFACE FINISH OF WELDS

Welds shall in general be treated so that they display good appearance and a surface suitable for painting. Welds shall show uniform sections, smoothness of weld metal, feather-edges without overlap, and freedom from porosity. Structural welds shall be ground and blended to avoid stress raisers. All welds which require radiographic or other nondestructive examination shall be dressed by chipping and grinding as required for good interpretation of radiographic film or interpretation by other weld examination

methods. Details of weld dressing and finishing and NDT testing shall be shown on the drawings submitted for approval.

5.0 BRAZING

5.1 GENERAL

All brazing and brazed joints shall meet the requirements specified below. Contractor shall ensure that suppliers comply with these requirements as they apply to the equipment being manufactured. Deviations from applicable codes, approved procedures, and approved detail drawings will not be permitted without prior written District approval. Materials or components with brazed joints made offsite will not be accepted if the brazing does not conform to the requirements of this Specification. Procedure shall be developed by Contractor for brazing all metals included in the Work. Brazing shall not be started until brazing procedures, brazers, and brazing operators have been qualified.

Selection of brazing processes and development of brazing procedures is part of the design process established by Contractor which shall take into account the stress levels and use of the specific component. It is the responsibility of Contractor to ensure that brazed joints are designed in accordance with the most advanced engineering standards and practices for each class of equipment.

5.2 BRAZING PROCEDURES

Contractor shall prepare a complete schedule of brazing procedures consisting of detailed procedure specifications for each joint to be brazed.

Brazing Procedure Specifications (BPSs) for all brazing shall be qualified per ASME Section IX. Contractor shall prepare written BPSs and PQRs that specify all the essential variables in a format similar to the sample forms noted in ASME Section IX. All BPSs shall be approved by Engineer prior to use for fabrication. Contractor shall allow a minimum of seven (7) full working days per BPS for approval.

Contractor shall ensure that approved BPSs are in the presence of brazing personnel prior to production brazing and that the contents of the BPS are being followed.

5.3 QUALIFICATION OF BRAZERS

Contractor shall be responsible for the quality of the work performed by its brazing organization. Brazing Performance Qualification (BPQs) records for all brazing personnel shall be qualified per ASME Section IX. Contractor shall prepare written BPQs that specify all the essential variables in a format similar to the sample forms noted in ASME Section IX. All brazers and brazing operators shall be tested and

qualified by Contractor in accordance to Section IX and shall have in their possession, a valid qualification record for the brazing positions and brazing processes to be used.

Factory brazing and brazing operator's certificates shall be furnished to Engineer prior to the commencement of the Work, if requested. Brazer qualification test records shall be maintained and kept current by Contractor for the duration of the Work.

5.4 BRAZING SHOWN ON DRAWINGS

Drawings submitted to Engineer for approval shall indicate the presence of brazing. The following information shall be shown on, or supplied with, the drawings for each brazed joint:

1. Brazing procedure employed,
2. Examination procedures and acceptance criteria applied.

Contractor shall also submit a brazing map for each component being brazed, which identifies the associated brazing process, BPS/BQR, and materials.

END OF SECTION 05050

SECTION 05500

METAL FABRICATIONS AND CASTINGS

TABLE OF CONTENTS

1.0	GENERAL	2
1.1	REFERENCES	2
1.2	SUBMITTALS	3
1.3	QUALITY ASSURANCE.....	3
1.4	DELIVERY, STORAGE, AND HANDLING	3
2.0	PRODUCTS.....	4
2.1	GENERAL	4
2.2	ACCESSORIES	4
2.3	FABRICATION.....	5
2.4	SOURCE QUALITY CONTROL	6
3.0	EXECUTION.....	6
3.1	INSTALLATION OF METAL FABRICATIONS	6
3.2	REPAIR OF GALVANIZED STEEL	7

SECTION 05500

METAL FABRICATIONS AND CASTINGS

1.0 GENERAL

1.1 REFERENCES

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

1. American Galvanizers Association (AGA): Inspection of Products Hot-Dip Galvanized After Fabrication.
2. American Institute of Steel Construction (AISC): S329, Allowable Stress Design Specification for Structural Joints using ASTM A325 or A490 Bolts.
3. American Iron and Steel Institute (AISI): Stainless Steel Types.
4. American Society of Mechanical Engineers (ASME): B1.1, Unified-inch Screw Threads (UN and UNR Thread Form).
5. American Welding Society (AWS): D1.1, Structural Welding Code - Steel.
6. ASTM International (ASTM):
 - a. A36/A36M, Specification for Carbon Structural Steel.
 - b. A123/A123M, Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - c. A143, Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
 - d. A153/A153M, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - e. A283/A283M, Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
 - f. A307, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile.
 - g. A325, Specification for Structural Bolts, Steel, Heat Treated 120/105 ksi Minimum Tensile Strength.
 - h. A384, Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies.
 - i. A385, Practice for Providing High-Quality Zinc Coatings (Hot-Dip).
 - j. A489, Specification for Carbon Steel Lifting Eyes.
 - k. A500, Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - l. A501, Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
 - m. A563, Specification for Carbon and Alloy Steel Nuts.
 - n. A653, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - o. A780, Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

- p. F436, Specification for Hardened Steel Washers.
 - q. F468, Specification for Nonferrous Bolts, Hex Cap Screws, and Studs for General Use.
 - r. F593, Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
 - s. F594, Specification for Stainless Steel Nuts.
 - t. F844, Specification for Washers, Steel, Plain (Flat), Unhardened for General Use.
 - u. F1554, Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
7. Specialty Steel Industry of North America (SSINA):
- a. Specifications for Stainless Steel.
 - b. Stainless Steel Fasteners.

1.2 SUBMITTALS

Submit the following in accordance with Section 01300, Administrative Requirements

1.2.1 Action Submittals

Shop Drawings: Metal fabrications, including welding and fastener information.

1.2.2 Informational Submittals

Hot-Dip Galvanizing: Certificate of compliance signed by galvanizer, with description of material processed and ASTM standard used for coating.

1.3 QUALITY ASSURANCE

Qualifications:

1. Galvanized Coating Applicator: Company specializing in hot-dip galvanizing after fabrication and following procedures of Quality Assurance Manual of the American Galvanizers Association.

1.4 DELIVERY, STORAGE, AND HANDLING

Insofar as practical, factory assemble items specified herein. Assemblies that due to necessity have to be shipped unassembled shall be packaged and tagged in manner that will protect materials from damage and will facilitate identification and field assembly.

Package stainless steel items in a manner to provide protection from carbon impregnation.

Protect hot-dip galvanized finishes from damage due to metal banding and rough handling. Use padded slings and straps.

Store fabricated items in dry area, not in direct contact with ground.

2.0 PRODUCTS

2.1 GENERAL

Unless otherwise indicated, meet the following requirements:

Item	ASTM Reference
Steel Shapes and Plates	A36/A36M
Hollow Structural Sections	A500, Grade B
Stainless Steel:	
Bolts, Threaded Rods, Anchor Bolts, and Anchor Studs	F593, AISI Type 316, Condition CW
Nuts	F594, AISI Type 316, Condition CW
Steel Bolts and Nuts:	
High-Strength	A325, Type 1 bolts, with A563 nuts
Eyebolts	A489
Threaded Rods	A36/A36M
Flat Washers (Unhardened)	F844
Flat and Beveled Washers (Hardened)	F436

Bolts, Washers, and Nuts: Use stainless steel, hot-dip galvanized steel, zinc-plated steel types.

Hinges: Heavy-duty brass or stainless steel with stainless steel pins.

2.2 ACCESSORIES

2.2.1 Antiseizing Lubricant for Stainless Steel Threaded Connections:

1. Resists washout.
2. Manufacturers and Products:
 - a. Bostik, Middleton, MA; Neverseez.
 - b. Saf-T-Eze Div., STL Corp., Lombard, IL; Anti-Seize.

2.3 FABRICATION

2.3.1 General

1. Finish exposed surfaces smooth, sharp, and to well-defined lines.
2. Furnish necessary rabbets, lugs, and brackets so work can be assembled in neat, substantial manner.
3. Conceal fastenings where practical; where exposed, flush countersink.
4. Drill metalwork and countersink holes as required for attaching hardware or other materials.
5. Grind cut edges smooth and straight. Round sharp edges to small uniform radius. Grind burrs, jagged edges, and surface defects smooth.
6. Fit and assemble in largest practical sections for delivery to Site.

2.3.2 Materials

1. Use steel shapes, unless otherwise noted.
2. Steel to be hot-dip galvanized: Limit silicon content to less than 0.04 percent or to between 0.15 and 0.25 percent.

2.3.3 Welding

1. Weld connections and grind exposed welds smooth. When required to be watertight, make welds continuous.
2. Welded fabrications shall be free from twisting or distortion caused by improper welding techniques.
3. Steel: Meet fabrication requirements of AWS D1.1, Section 5.
4. Complete welding before applying finish.

2.3.4 Galvanizing

1. Fabricate steel to be galvanized in accordance with ASTM A143, ASTM A384, and ASTM A385. Avoid fabrication techniques that could cause distortion or embrittlement of the steel.
2. Provide venting and drain holes for tubular members and fabricated assemblies in accordance with ASTM A385.
3. Remove welding slag, spatter, burrs, grease, oil, paint, lacquer, and other deleterious material prior to delivery for galvanizing.
4. Remove by blast cleaning or other methods surface contaminants and coatings not removable by normal chemical cleaning process in the galvanizing operation.
5. Hot-dip galvanize steel members, fabrications, and assemblies after fabrication in accordance with ASTM A123/A123M.
6. Hot-dip galvanize bolts, nuts, washers, and hardware components in accordance with ASTM A153/A153M. Oversize holes and nut threads to allow for zinc alloy growth. Shop assemble bolts and nuts.
7. Galvanized steel sheets in accordance with ASTM A653.

8. Galvanize components of bolted assemblies separately before assembly. Galvanizing of tapped holes is not required.

2.3.5 Fitting

Where movement of fabrications is required or shown, cut, fit, and align items for smooth operation. Make corners square and opposite sides parallel.

2.3.6 Accessories

Furnish as required for a complete installation. Fasten by welding or with stainless steel bolts or screws.

2.4 SOURCE QUALITY CONTROL

2.4.1 Visually inspect all fabrication welds and correct any deficiencies.

1. Steel: AWS D1.1, Section 6 and Table 6.1, Visual Inspection Acceptance Criteria.

2.4.2 Hot-Dip Galvanizing

1. An independent testing agency shall be retained by Contractor and approved by Engineer to inspect and test hot-dip galvanized fabricated items in accordance with ASTM A123/A153M and ASTM A153/A153M.
2. Visually inspect and test for thickness and adhesion of zinc coating for minimum of three test samples from each lot in accordance with ASTM A123/A123M and ASTM A153/A153M.
3. Reject and retest nonconforming articles in accordance with ASTM A123/A123M and ASTM A153/A153M.

3.0 EXECUTION

3.1 INSTALLATION OF METAL FABRICATIONS

Install metal fabrications plumb or level, accurately fitted, free from distortion or defects.

Install rigid, substantial, and neat in appearance.

Install manufactured products in accordance with manufacturer's recommendations.

Obtain Engineer approval prior to field cutting steel members or making adjustments not scheduled.

3.2 REPAIR OF GALVANIZED STEEL

Repair of Damaged Hot-Dip Galvanized Coating:

1. Conform to ASTM A780.
2. For minor repairs at abraded areas, use sprayed zinc conforming to ASTM A780.
3. For flame cut or welded areas, use zinc-based solder, or zinc sticks, conforming to ASTM A780.
4. Use magnetic gauge to determine that thickness is equal to or greater than the base galvanized coating.

END OF SECTION 05500

SECTION 09902

PAINTING

TABLE OF CONTENTS

1.0	GENERAL	2
1.1	REFERENCES	2
1.2	DEFINITIONS	2
1.3	SUBMITTALS	3
1.4	QUALITY ASSURANCE	4
1.5	DELIVERY, STORAGE, AND HANDLING	4
1.6	PROJECT CONDITIONS	4
1.7	EXTRA MATERIALS	4
2.0	PRODUCTS	5
2.1	MANUFACTURERS	5
2.2	ABRASIVE MATERIALS	5
2.3	PAINT MATERIALS	5
2.4	COLORS	6
2.5	SHOP FINISHES	6
3.0	EXECUTION	7
3.1	GENERAL	7
3.2	PROTECTION OF MATERIALS NOT TO BE PAINTED	7
3.3	FIELD SANDBLASTING	8
3.4	PREPARATION OF SURFACES	8
3.5	PAINT MIXING	9
3.6	PAINT APPLICATION	9
3.7	PROTECTIVE COATINGS SYSTEMS	11
3.8	FIELD QUALITY CONTROL	11
3.9	MANUFACTURER'S SERVICES	13
3.10	CLEANUP	13
3.11	APPLICATION SCHEDULE	13
4.0	DATA SHEETS	15

SECTION 09902

PAINTING

1.0 GENERAL

1.1 REFERENCES

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

1. NACE International (NACE): RP0188, Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates.
2. The Society for Protective Coatings (SSPC):
 - a. PA 2, Measurement of Dry Coating Thickness with Magnetic Gages.
 - b. PA 3, Guide to Safety in Paint Applications.
 - c. SP 1, Solvent Cleaning.
 - d. SP 2, Hand Tool Cleaning.
 - e. SP 3, Power Tool Cleaning.
 - f. SP 5, Joint Surface Preparation Standard White Metal Blast Cleaning.
 - g. SP 6, Joint Surface Preparation Standard Commercial Blast Cleaning.
 - h. SP 7, Joint Surface Preparation Standard Brush-Off Blast Cleaning.
 - i. SP 10, Joint Surface Preparation Standard Near-White Blast Cleaning.
 - j. SP 11, Power Tool Cleaning to Bare Metal.
 - k. SP 12, Surface Preparation and Cleaning of Steel and Other Hard Materials by High- and Ultrahigh-Pressure Water Jetting Prior to Recoating.
 - l. SP 13, Surface Preparation of Concrete.

1.2 DEFINITIONS

Terms used in this section:

1. Coverage: Total minimum dry film thickness in mils or square feet per gallon.
2. HCl: Hydrochloric Acid.
3. MDFT: Minimum Dry Film Thickness, mils.
4. MDFTPC: Minimum Dry Film Thickness per Coat, mils.
5. Mil: Thousandth of an inch.
6. PDS: Product Data Sheet.
7. PSDS: Paint System Data Sheet.
8. PVC: Polyvinyl Chloride.
9. SFPG: Square Feet per Gallon.
10. SFPGPC: Square Feet per Gallon per Coat.
11. SP: Surface Preparation.

1.3 SUBMITTALS

1.3.1 Action Submittals

1.3.1.1 Shop Drawings

Product Data Sheets:

1. For each product, furnish a Product Data Sheet (PDS), the manufacturer's technical data sheets, and paint colors available (where applicable). The PDS form is appended to the end of this section.
2. For each paint system, furnish a Paint System Data Sheet (PSDS). The PSDS form is appended to the end of this section.
3. Furnish copies of paint system submittals to coating applicator.
4. Indiscriminate submittal of manufacturer's literature is not acceptable.

Detailed chemical and gradation analysis for each proposed abrasive material.

1.3.1.2 Samples

Reference Panel:

1. Prior to start of surface preparation, furnish a 4-inch by 4-inch steel panel prepared to specified requirements for each grade of sandblast specified herein.
 - a. Provide panel representative of steel used, and prevent from deterioration of surface quality.
 - b. Upon approval by Engineer, preserve panel as reference source for inspection.
2. Paint:
 - a. Before painting work is started, prepare minimum 8-inch by 10-inch Sample with type of paint and application specified, on similar substrate to which paint is to be applied.
 - b. Furnish additional Samples as required until colors, finishes, and textures are approved.
 - c. Approved Samples to be quality standard for final finishes.

1.3.2 Informational Submittals

Manufacturer's written verification that submitted products are suitable for the intended use.

Factory Applied Coatings: Manufacturer's certification stating factory applied coating system meets or exceeds requirements specified herein.

If manufacturer of finish coating differs from that of shop primer, provide both manufacturers' written confirmation that materials are compatible.

Coating Manufacturer's Certificate of Compliance.

1.4 QUALITY ASSURANCE

1.4.1 Applicator's Experience

Minimum 5 years' practical experience in application of specified products.

1.4.2 Regulatory Requirements

Meet federal, state, and local requirements limiting emission of volatile organic compounds.

Perform surface preparation and painting in accordance with recommendations of the following:

1. Paint manufacturer's instructions.
2. SSPC PA 3, Guide to Safety in Paint Applications.
3. Federal, state, and local agencies having jurisdiction.

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver materials to Site in unopened containers that plainly show designated name, date of manufacture, color, and manufacturer.

Store paints in a protected area that is heated or cooled to maintain temperature range recommended by paint manufacturer.

1.6 PROJECT CONDITIONS

Environmental Requirements:

1. Do not apply paint in temperatures outside of manufacturer's recommended maximum or minimum allowable, or in dust, smoke-laden atmosphere, damp or humid weather.
2. Do not perform abrasive blast cleaning whenever relative humidity exceeds 85 percent, or whenever surface temperature is less than 5 degrees F above dewpoint of ambient air. Strictly adhere to coating manufacturer's recommendations.

1.7 EXTRA MATERIALS

Provide small quantity kits for touchup painting and for painting other small areas.

Fusion Bonded Coating: Provide appropriate liquid repair kits for field use.

2.0 PRODUCTS

2.1 MANUFACTURERS

Paint manufacturer shall be nationally recognized manufacturer of paints and protective coatings and regularly engaged in production of such materials that have essentially identical service conditions as this Project.

Minimum of 5 years' verifiable experience in manufacture of specified products.

2.2 ABRASIVE MATERIALS

Select abrasive type and size to produce surface profile that meets coating manufacturer's recommendations for specific primer and coating system to be applied.

2.3 PAINT MATERIALS

2.3.1 General

Material Quality: Manufacturer's highest quality products and suitable for the intended service.

Materials, Including Primer and Finish Coats: Produced by same paint manufacturer.

Thinners, Cleaners, Driers, and Other Additives: As recommended by paint manufacturer of particular coating.

2.3.2 Products

Product	Definition
Acrylic Latex	Single component, gloss as specified
Acrylic Sealer	Clear acrylic
Alkyd Enamel	Optimum quality, gloss or semigloss finish as specified, medium long oil
Bituminous Paint	Single-component, coal-tar pitch based
Coal-Tar Epoxy	Amine, polyamide, or phenolic epoxy type; 70% volume solids minimum, suitable for immersion service
Epoxy Filler/Surfacer	100 percent solids epoxy trowel grade filler and surfacer, nonshrinking, suitable for application to concrete and masonry. Approved for potable water contact and conforming to NSF 61, where required
Epoxy Primer	Converted epoxy primer containing rust-inhibitive pigments

Product	Definition
High Build Epoxy	Polyamidoamine epoxy, minimum 69% volume solids, capability of 4 MDFT to 8 MDFT per coat
Inorganic Zinc Primer	Solvent or water based, having 85% metallic zinc content in the dry film; follow manufacturer's recommendation for topcoating
NSF Epoxy	Polyamidoamine epoxy, approved for potable water contact and conforming to NSF 61
Epoxy, High Solids	Polyamidoamine epoxy, 80% volume solids, minimum, suitable for immersion service
Polyurethane Enamel	Two-component, aliphatic or acrylic based polyurethane; high gloss finish
Rust-Inhibitive Primer	Single-package steel primers with anticorrosive pigment loading
Silicone/Silicone Acrylic	Elevated temperature silicone or silicone/acrylic based
Stain, Concrete	Acrylic, water repellent, penetrating stain

2.4 COLORS

Provide as shown for buildings, equipment and appurtenances and designated herein to be selected by Owner.

Formulate with colorants free of lead, lead compounds, or other materials, which might be affected by presence of hydrogen sulfide or other gas likely to be present at Site.

Proprietary identification of colors is for identification only. Any authorized manufacturer may supply matches.

2.5 SHOP FINISHES

2.5.1 Shop Blast Cleaning

Reference paragraph Shop Coating Requirements, this section.

2.5.2 Surface Preparation

Provide Engineer minimum 7 days' advance notice to start of shop surface preparation work and coating application work.

2.5.3 Shop Coating Requirements

When required by equipment Specifications, such equipment shall be primed and finish coated in shop by manufacturer and touched up in field with identical material after installation.

Where manufacturer's standard coating is not suitable for intended service condition, Engineer may approve use of a tie-coat to be used between manufacturer's standard coating and specified field finish. In such cases, tie-coat shall be surface tolerant epoxy as recommended by manufacturer of specified field finish coat. Coordinate details of equipment manufacturer's standard coating with field coating manufacturer.

3.0 EXECUTION

3.1 GENERAL

Surface Preparation Inspection:

1. Inspect and provide substrate surfaces prepared in accordance with these Specifications and printed directions and recommendations of paint manufacturer whose product is to be applied. In event of conflict, more stringent shall apply.
2. Notify Engineer minimum 7 days' prior to start of surface preparation work or coating application work.
3. Perform work only in presence of Engineer, unless Engineer grants prior approval to perform work in Engineer's absence.

For coatings subject to immersion, obtain full cure for completed system. Consult coatings manufacturer's written instructions for these requirements. Do not immerse coating until completion of curing cycle.

The intention of these Specifications is for new, interior and exterior metal and submerged metal surfaces to be painted, whether specifically mentioned or not, except as modified herein. Concealed structural steel surfaces shall receive prime coat only, unless modified herein. Exterior concrete surfaces will not be painted, unless specifically indicated herein.

Perform painting in accordance with recommendations of the following:

1. Paint manufacturer's instructions.
2. Federal, state, and local agencies having jurisdiction.

3.2 PROTECTION OF MATERIALS NOT TO BE PAINTED

Protect all surfaces adjacent to, or downwind of Work area from overspray. Contractor shall be responsible for any damages resulting from overspray.

Remove, mask, or otherwise protect hardware, lighting fixtures, switchplates, aluminum surfaces, machined surfaces, couplings, shafts, bearings, nameplates on machinery, and other surfaces not specified elsewhere.

Provide drop cloths to prevent paint materials from falling on or marring adjacent surfaces.

Protect working parts of mechanical and electrical equipment from damage.

Mask openings in motors to prevent paint and other materials from entering the motors.

3.3 FIELD SANDBLASTING

Perform sandblasting for items and equipment where required to restore damaged surfaces previously shop or field blasted and primed. Materials, equipment, procedures shall meet requirements of SSPC.

3.4 PREPARATION OF SURFACES

3.4.1 Metal Surface Preparation

General:

1. Submit samples prior to surface preparation blasting.
2. Conform to current SSPC specifications as follows:
 - a. Solvent Cleaning: SP 1.
 - b. Hand Tool Cleaning: SP 2.
 - c. Power Tool Cleaning: SP 3.
 - d. White Metal Blast Cleaning: SP 5.
 - e. Commercial Blast Cleaning: SP 6.
 - f. Brush-Off Blast Cleaning: SP 7.
 - g. Near-White Blast Cleaning: SP 10.
 - h. Power Tool Cleaning to Bare Metal: SP 11.
 - i. High Pressure Waterjetting: SP 12.
3. Where OSHA or EPA regulations preclude standard abrasive blast cleaning, wet- or vacu-blast methods may be required. Follow coatings manufacturers' recommendations for wet-blast additives and first coat application.
4. Hand-tool clean areas that cannot be cleaned by power-tool cleaning.

Blast Cleaning Requirements:

1. Comply with applicable federal, state, and local, air pollution and environmental control regulations for blast cleaning and disposition of spent aggregate and debris.
2. Alternatives to standard abrasive blast cleaning methods subject to Engineer review.

3.5 PAINT MIXING

Multiple-Component Coatings:

1. Prepare using contents of container for each component as packaged by paint manufacturer.
2. No partial batches will be permitted.
3. Do not use multiple-component coatings that have been mixed beyond their pot life.
4. Mix only components specified and furnished by paint manufacturer.
5. Do not intermix additional components for reasons of color or otherwise, even within same generic type of coating.

Keep paint materials sealed when not in use.

Where more than one coat of material is applied within given system, alternate color to provide visual reference that required number of coats has been applied.

3.6 PAINT APPLICATION

3.6.1 General

Inspection: Schedule with Engineer in advance for cleaned surfaces and all coats prior to succeeding coat.

Apply coating in accordance with paint manufacturer's recommendations. Allow sufficient time between coats to ensure thorough drying of previously applied paint.

Fusion Bonded Coating Application: Electrostatic, fluidized bed, or flocking.

Paint units to be bolted together and to structures, prior to assembly or installation.

Extent of Coating (Immersion): Coatings shall be applied to internal vessel and pipe surfaces, nozzle bores, flange gasket sealing surfaces, carbon steel internals, and stainless steel internals, unless otherwise specified.

3.6.2 Shop Primed or Factory Finished Surfaces

Inspection: Schedule inspection for compliance with Specifications of shop primed or factory finished items with Engineer in advance of delivery to Site.

Hand or power sand areas of chipped, peeled, or abraded coating, feathering the edges. Follow with a spot primer using specified primer.

For two-package or converted coatings, consult coatings manufacturer for specific procedures as relates to manufacturer's products.

Prior to application of finish coats, clean shop-primed surfaces free of dirt, oil, and grease and apply mist coat of specified primer, 1-mil dry film thickness.

After welding, prepare and prime holdback areas as required for specified paint system. Apply primer in accordance with manufacturer's instructions.

3.6.3 Manufacturer Applied Paint Systems

Repair abraded areas on factory finished items in accordance with equipment manufacturer's directions.

Carefully blend repaired areas into original finish.

3.6.4 Film Thickness and Coverage

Number of Coats:

1. Minimum required, irrespective of coating thickness.
2. Additional coats may be required to obtain minimum required paint thickness, depending on method of application, differences in manufacturers' products, and atmospheric conditions.

Application Thickness:

1. Do not exceed coating manufacturer's recommendations.
2. Use wet film thickness gauge to measure proper coating thickness during application.

Film Thickness Measurement and Electrical Inspection of Coated Surface:

1. Perform with properly calibrated instruments.
2. Recoat and repair as necessary for compliance with Specifications.
3. Coats will be subject to inspection by Engineer and coating manufacturer's representative.

Visually inspect concrete, nonferrous metal, plastic, and wood surfaces to ensure proper and complete coverage has been attained.

Give particular attention to edges, angles, flanges, and other similar areas, where insufficient film thickness are likely to be present, and ensure proper millage in these areas.

Apply additional coats as required to complete hiding of underlying coats. Hiding shall be so complete that additional coats would not increase hiding.

3.7 PROTECTIVE COATINGS SYSTEMS

3.7.1 System No. 1 Submerged Metal

Surface Prep.	Paint Material	Min. Coats, Cover
SP 5, White Metal Blast Cleaning	Prime in accordance with manufacturer's recommendations	
	Coal-Tar Epoxy	2 coats, 16 MDFT

3.7.2 System No. 2 Exposed Metal—Mildly Corrosive

Surface Prep.	Paint Material	Min. Coats, Cover
SP 10, Near-White Metal Blast Cleaning	Epoxy Primer	1 coat, 2.5 MDFT
	Polyurethane Enamel	1 coat, 3 MDFT

3.7.3 System No. 3 Exposed Metal—Atmospheric

Surface Prep.	Paint Material	Min. Coats, Cover
SP 6, Commercial Blast Cleaning	Rust-Inhibitive Primer	1 coat, 2 MDFT
	Alkyd Enamel	2 coats, 4 MDFT

3.7.4 System No. 4 Aluminum and Dissimilar Metal Insulation

Surface Prep.	Paint Material	Min. Coats, Cover
SP 1, Solvent Cleaning	Prime in accordance with manufacturer's recommendations	
	Bituminous Paint	1 coat, 10 MDFT

3.8 FIELD QUALITY CONTROL

3.8.1 Testing Equipment

Provide magnetic type dry film thickness gauge, to test coating thickness specified in mils, as manufactured by Nordson Corp., Anaheim, CA; Mikrotest.

Provide electrical holiday detector, low voltage, wet sponge type, to test completed coating systems, 20 mils or less MDFT, for holidays and discontinuities as manufactured by Tinker and Razor, San Gabriel, CA, Model M-1.

Provide high voltage holiday detector for coatings in excess of 20 mils MDFT. Unit as recommended by coating manufacturer.

3.8.2 Testing

Thickness and Continuity Testing:

1. Measure coating thickness specified in mils with magnetic type dry film thickness gauge in accordance with SSPC PA 2.
2. Check each coat for correct millage. Do not make measurement within 8 hours, minimum, after application of coating.
3. Test finish coat, 20 mils thick or less, except zinc primer, galvanizing, and elastomeric coatings, for holidays and discontinuities with electrical holiday detector, low voltage, wet sponge type in accordance with NACE RP0188.
4. Holiday detect coatings in excess of 20 mils MDFT with high voltage units recommended by coating manufacturer, and in accordance with NACE RP0188.
5. After repaired and recoated areas have dried sufficiently, retest each repaired area. Final test may also be conducted by Engineer.

3.8.3 Unsatisfactory Application

Clean and top coat surfaces found to have improper finish color or insufficient film thickness.

Evidence of runs, bridges, shiners, laps, or other imperfections shall be cause for rejection.

Repair defects in coating system per written recommendations of coating manufacturer.

Leave staging up until Engineer has inspected surface or coating. Replace staging removed prior to approval by Engineer.

3.8.4 Damaged Coatings, Pinholes, and Holidays

Feather edges and repair in accordance with recommendations of paint manufacturer.

Hand or power sand visible areas of chipped, peeled, or abraded paint, and feather edges. Follow with primer and finish coat in accordance with Specifications. Depending on extent of repair and appearance, finish sanding and topcoat may be required.

Repair fusion bonded coatings as recommended by original applicator.

Apply finish coats, including touchup and damage-repair coats, in a manner, which will present uniform texture and color-matched appearance.

3.9 MANUFACTURER'S SERVICES

Coating manufacturer's representative shall be present at Site as follows:

1. On first day of application of any coating.
2. Minimum of two additional Site inspection visits as required to resolve field problems attributable to, or associated with, manufacturers' product.
3. As required to verify full cure of coating prior to coated surfaces being placed into immersion service.

3.10 CLEANUP

Place cloths and waste that might constitute fire hazard in closed metal containers or destroy at end of each day.

Upon completion of work, remove staging, scaffolding, and containers from Site or destroy in legal manner.

Completely remove paint spots, oil, or stains from adjacent surfaces and floors and leave entire job clean.

3.11 APPLICATION SCHEDULE

3.11.1 Surfaces Not Requiring Painting

Unless otherwise stated herein or shown, the following areas or items will not require painting:

1. Concrete surfaces.
2. Nonferrous and corrosion-resistant ferrous alloys such as copper, bronze, Monel, aluminum, chromium plate, atmospherically exposed weathering steel, and stainless steel, except where:
 - a. Required for electrical insulation between dissimilar metals.
 - b. Aluminum and stainless steel are embedded in concrete or masonry, or aluminum is in contact with concrete or masonry.
 - c. Color coding of equipment and piping is required.
3. Nonmetallic materials such as glass, wood and porcelain, except as required for architectural painting or color coding.
4. Prefinished electrical and architectural items such as motor control centers, switchboards, switchgear, panelboards, transformers, disconnect switches, acoustical tile, cabinets, elevators, building louvers, wall panels, color coding of equipment is required.
5. Nonsubmerged electrical conduits attached to unpainted concrete surfaces.
6. Cathodic protection anodes.
7. Items specified to be galvanized after fabrication, unless specified elsewhere or subject to immersion.

8. Insulated piping and insulated piping with jacket will not require exterior coating, except as required for architectural painting or color coding.

3.11.2 System No. 1 Submerged Metal

Use on the following items or areas:

1. Metal surfaces new below a plane 1 foot above maximum liquid surface, metal surfaces above maximum liquid surface which are part of immersed equipment, concrete embedded surfaces of metallic items, such as wall pipes, pipes, pipe sleeves, access manholes, gate guides and thimbles, and structural steel, except reinforcing steel and the following specific surfaces:
 - a. Interior surfaces of steel piping noted in Piping Schedule as shown.

3.11.3 System No. 2 Exposed Metal—Mildly Corrosive

Use on the following items or areas:

1. Exposed metal surfaces, new, located inside or outside of structures and exposed to weather or in highly humid atmosphere.

3.11.4 System No. 3 Exposed Metal—Atmospheric

Use on the following items or areas:

1. Exposed metal surfaces, new located inside or outside of structures and exposed to weather, including metal doors and frames, vents, louvers, interior metal ductwork, flashing, sheet metalwork and miscellaneous architectural metal trim.
2. Apply surface preparation and primer to surfaces prior to installation. Finish coats need only be applied to surfaces exposed after completion of construction.

3.11.5 System No. 4 Aluminum and Dissimilar Metal Insulation

Use on aluminum surfaces embedded or in contact with concrete.

4.0 DATA SHEETS

PAINT SYSTEM DATA SHEET

Complete this PSDS for each coating system, include all components of the system (surface preparation, primer, intermediate coats, and finish coats). Include all components of a given coating system on a single PSDS.

Paint System Number (from Spec.):		
Paint System Title (from Spec.):		
Coating Supplier:		
Representative:		
Surface Preparation:		
Paint Material (Generic)	Product Name/Number (Proprietary)	Min. Coats, Coverage

PAINT PRODUCT DATA SHEET

Complete and attach manufacturer's Technical Data Sheet to this PDS for each product submitted. Provide manufacturer's recommendations for the following parameters at temperature (F)/relative humidity:

Temperature/RH	50/50	70/30	90/25
Induction Time			
Pot Life			
Shelf Life			
Drying Time			
Curing Time			
Min. Recoat Time			
Max. Recoat Time			

Provide manufacturer's recommendations for the following:

Mixing Ratio: _____

Maximum Permissible Thinning: _____

Ambient Temperature Limitations: min.: _____ max.: _____

Surface Temperature Limitations: min.: _____ max.: _____

Surface Profile Requirements: min.: _____ max.: _____

END OF SECTION 09902

SECTION 11215

VERTICAL PUMPS

TABLE OF CONTENTS

1.0	GENERAL	2
1.1	SECTION INCLUDES	2
1.2	REFERENCES	2
1.3	INFORMATION TO BE SUPPLIED WITH BID.....	2
1.4	CONTRACT SUBMITTALS	3
2.0	PRODUCTS	4
2.1	GENERAL	4
2.2	NAMEPLATES.....	4
2.3	PUMP OPERATING CONDITIONS	4
2.4	PUMP CONSTRUCTION DETAILS	5
2.5	FACTORY FINISHING.....	8
2.6	ACCESSORIES	9
2.7	SPARE PARTS	9
3.0	EXECUTION	10
3.1	GENERAL	10
3.2	QUALITY ASSURANCE AND QUALITY CONTROL	10
3.3	TESTS AND INSPECTIONS.....	10
3.4	MANUFACTURER'S SERVICES.....	11
3.5	MAINTENANCE SCHEDULE AND AGREEMENT	12
3.6	SUPPLEMENTS.....	12

SECTION 11215

VERTICAL PUMPS

1.0 GENERAL

1.1 SECTION INCLUDES

Requirements for designing, testing, and providing vertical line shaft propeller pumps, suction piping, suction cans, lifting assemblies, and all accessories and appurtenances as shown on the Drawings and as specified herein. Pump installation, discharge piping, and flap gates are not included in this contract.

See Section 16220 for motors, motor supports, and connection cables.
See Section 16700 for Instrumentation and Controls.

1.2 REFERENCES

The Work of this Section shall comply with the latest editions of the following references and codes as adopted by the District:

1. Uniform Mechanical Code (UMC).
2. Uniform Plumbing, Code (UPC).
3. Uniform Fire Code (UFC).
4. National Electrical Code (NEC).
5. Uniform Building Code (UBC).
6. American Iron & Steel Institute (AISI).
7. American Society for Testing and Materials (ASTM).
8. National Electrical Manufacturers' Association (NEMA).
9. Anti-Friction Bearing Manufacturers Association (AFBMA).
10. International Standards Organization (ISO) - ISO9001.
11. Hydraulic Institute Standards (HIS), Centrifugal Pumps.

Terminology pertaining to pumping unit performance and construction shall conform to the ratings and nomenclature of the Hydraulic Institute Standards and of ANSI/AWWA E101, American National Standard for Vertical Turbine Pumps.

1.3 INFORMATION TO BE SUPPLIED WITH BID

The pump manufacturer shall submit, with its bid:

1. Complete catalog information, descriptive literature and identification of materials of construction.
2. A certified performance curve for the proposed pump unit, based on the gross head conditions described in this Section and calculated. The curve shall include flow, head, brake horsepower requirement, bowl efficiency, overall efficiency,

minimum required submergence with margin, NPSH required including HIS margin, pump speed and electrical specifications, including power consumption, for the pump over its entire range of operation including the recommended range of stable operation and shall include reduced speed curves at 10 percent increments and system curves.

3. Indicate pump suction and discharge head losses and pump column losses at the design point.
4. Pump maximum downthrust or upthrust in pounds.
5. Suction can and piping dimensions and information.

1.4 CONTRACT SUBMITTALS

Submit in accordance with Section 01300, Administrative Requirements.

Submit the following detailed shop drawings as part of the first shop drawing submittal:

1. Certified dimensional outline and installation drawing plans and sections, with clearance requirements, lifting and support connections, and power cable routing.
2. Weight of each pump assembly and pump discharge can.
3. Impeller speed, number of blades and motor speed.

Submit the following detailed shop drawings as part of the second shop drawing submittal:

1. Detailed plan and cross-sectional drawings of the pump arrangement with key parts and materials of construction.
2. Complete description of all factory finish systems including materials data sheets.
3. Detailed cross-sectional drawing of the motor and pump assembly showing mechanical seal, pump bearings, and lubrication system.
4. Power and control wiring diagrams, including terminals and numbers.
5. Electrical drawings including circuit schematics, interconnection diagrams, and all information necessary for connection of motors and electrical and instrumentation components.
6. Complete detailed parts list.
7. Suggested spare parts list to maintain the equipment in service for a period of 1 year and 5 years. Include a list of special tools required for checking, testing, parts replacement, and maintenance with current price information.

Submit the following detailed shop drawings as part of the third shop drawing submittal:

1. Special shipping, storage and protection, and handling instructions.
2. Manufacturer's printed installation instructions.

Submit the following shop drawings as part of the fourth shop drawing submittal:

1. Certified factory inspection report for all pumps.
2. Certified factory test reports for production test pumps.
3. Operation and Maintenance Manuals including complete operating instructions, maintenance requirements and schedules, copies of all shop drawings, parts lists, catalog cut data, and complete part numbers for all purchased items. Provide separate O&M manuals for pumps and electrical power system (five copies).

Submit the following data 30 days prior to request for final payment:

1. Certified field test report.
2. As-constructed equipment drawings (to include any field changes).

2.0 PRODUCTS

2.1 GENERAL

2.1.1 Like Items of Equipment

Provide end products of one manufacturer in order to achieve standardization for appearance, operation, maintenance, spare parts, and manufacturer's service.

2.2 NAMEPLATES

Nameplates: Equipment nameplates of stainless steel shall be stamped and fastened to the equipment in accessible locations with stainless steel screws or drive pins. Nameplates shall contain the manufacturer's name, model, serial number, size, characteristics, and appropriate data describing the machine performance ratings.

2.3 PUMP OPERATING CONDITIONS

Service conditions under which the pumps will operate are as follows:

1. Number of Pumps: Five.
2. Liquid Pumped: Fresh water.
3. Design Liquid Temperature: 40 to 70 degrees F.
4. Pumping Cycle: Continuous during fish bypass season; shut down during remainder of year.
5. Minimum and Maximum Approach Water Depths and Pump Submergence as shown on Drawings.

Definition of Pump Operating Heads:

1. **Pump Gross Head:** The difference in water surface level between the pump exit well and pump approach well, measured in feet. Approach velocity head, exit velocity head, internal pump losses, fish screen losses, suction and discharge line losses, and flap gate losses are not included in the pump gross head.
2. **Minimum Gross Head:** The minimum expected gross head for normal pump operation.
3. **Maximum Gross Head:** the maximum expected gross head for normal pump operation.
4. **Design Gross Head:** The expected nominal gross head for pump operation. This head condition will be the primary basis for pump hydraulic design.
5. **Pump Total Dynamic Head (TDH):** As defined by the Hydraulic Institute, Centrifugal Pumps, Test Standards.

The pumps shall meet the following performance requirements:

1. **Clean Water Pumping Capacity:** The pumps shall operate smoothly, without vibration or surges over a gross head range of 15.4 to 12.0 feet. In the overall project, the District must meet specific flow approach and exit velocity criteria to satisfy regulatory and environmental constraints on the project. Therefore, the pump equipment shall be designed to perform within the following flow and head ranges:
 - a. Pump Gross Head (ft): 15.4.
 - b. Design Flow at Pump Gross Head (5 pumps): 260 cfs.
 - c. Pump Gross Head at Best Efficiency Point (ft): 13.8.
 - d. Bowl Efficiency, Minimum: 80 percent.
2. **Maximum Propeller Speed:** 880 rpm.
3. **NPSH Margin:** _____
4. **Pump performance curve** shall exhibit a continuously rising head throughout the operating head range.

2.4 PUMP CONSTRUCTION DETAILS

2.4.1 Pump Configuration

Vertical, oil-lubricated, propeller (axial flow) type driven by a solid shaft, squirrel-cage motor with below ground discharge.

2.4.2 Materials

Cast iron, bronze-fitted, unless otherwise hereinafter specified. ASTM, AISI, etc., numbers, types, and grades specified are typical of material composition and quality. Equivalent materials will require review and approval by the Engineer.

2.4.3 Lineshaft

Enclosed, oil-lubricated type. Cold forged steel, ASTM A108, Grade C-1045, PSQ.

2.4.4 Shaft Couplings

Keyed construction, ASTM A108, Grade C-1020.

2.4.5 Lineshaft Bearings

Bronze, ASTM B145, Grade 5A (CDA844), grooved for oil lubrication.

Bearing spacing shall be as required to prevent resonant vibrations of the lineshaft, but not greater than 10 feet.

Bearings shall be secured in enclosing tube with flanged and bolted joints.

Top bearing shall be threaded to the enclosing tube tension nut.

2.4.6 Shaft Enclosing Tube

Steel pipe, ASTM A120, Grade B, Schedule 80.

The enclosing tube shall be fabricated integral with the individual sections of column pipe and discharge elbow.

2.4.7 Tension Nut

Cast iron with bronze lock ring and bearing or all bronze construction.

Threaded to the enclosing tube to allow tensioning.

Provide two NPT connections for oil lubrication tubing.

Bearing grooved for oil lubrication.

Bronze to be ASTM B144, Grade 3B (CDA932).

2.4.8 Bowl Shaft

Stainless steel, ASTM A276, Type 416, PSQ.

2.4.9 Impeller

Bronze, ASTM B145, Grade 4A (Alloy 903).

Provide shaft keys, thrust rings, and fasteners of stainless steel, ASTM A582, Type 416.

Statically and dynamically balanced.

2.4.10 Bowl and Suction Bell

Cast iron, ASTM A48, Class 30.

Flanged and registered.

Suction bell bearing cap shall not extend below bell lip greater than 4 inches.

Provide bypass ports to relieve pressure in enclosing tube.

Provide guide vanes to minimize losses and prevent vortexing.

Hydrostatic test at 1.5 times pump shutoff head.

2.4.11 Bowl and Suction Bell Bearings

Bronze, ASTM B144, Grade 3B (CDA932).

Provide grease-lubricated bearing in suction bell with Type 316 stainless steel grease line from baseplate.

Bearing lengths shall be not less than two times the shaft diameter.

Provide protecting collar at suction bell bearing, bronze construction.

Provide bearings on both sides of impeller.

2.4.12 Discharge Elbow

Below-base type, fabricated steel.

Flanged discharge nozzle

Four-section mitered elbow, 42-inch ID, minimum 3/8-inch wall thickness.

2.4.13 Column Pipe

Fabricated steel.

Provide flanged and registered joints at column connections.

Length not to exceed 10 feet.

Support column between discharge elbow and baseplate shall be 36-inch OD, 3/8-inch wall thickness.

2.4.14 Pump Baseplate and Soleplate

Constructed of steel plate with thickness of baseplate and soleplate as required for weight of pump but no less than 1-1/2 inches.

2.4.15 Discharge Column

Fabricated steel, 36-inch OD, 3/8-inch wall thickness.

Provide flanged and registered joints.

Length not to exceed 10 feet.

2.4.16 Motor Stand

Provide motor stand between baseplate and motor with windows for access to headshaft coupling and top enclosing tube bearing.

Provide guards on access windows in compliance with OSHA requirements.

2.4.17 Headshaft Coupling

Flanged, two or three-piece, steel AISI 1020.

Registered fits to assure positive alignment.

Dynamically balanced and match marked.

2.4.18 Oil Lubrication

Two-gallon oil reservoir.

Sight feed oil drip valve.

Solenoid valve, 120 volts ac, normally open, energize to close, NEMA 4X enclosure.

Locate oil reservoir and valves on motor stand.

2.4.19 Suction Cans

2.4.20 Suction Piping

2.5 FACTORY FINISHING

Interior surfaces of discharge elbow, interior and exterior surfaces of column pipe, and OD of enclosing tube.

1. Prepare, prime, and finish coat in accordance with Section 09902, Painting, System No. 1.

Interior and Exterior Surfaces of the Suction Bell and Bowl Assembly: Prepare, prime, and finish coat in accordance with Section 09902, Painting, System No. 29.

Exterior Surfaces of Discharge Elbow, Baseplate, Soleplate, Motor Stand, and Motor: Prepare and prime coat in accordance with Section 09902, Painting, System No. 5.

2.6 ACCESSORIES

2.6.1 Equipment Identification Plate

A stainless steel nameplate shall be attached to each pump on the motor stand and 1/4-inch die-stamped with the following information:

1. Manufacturer's name.
2. Manufacturer's size and model designation.
3. Serial number.
4. Rated capacity and head.
5. Rated speed.
6. Impeller adjustment clearance.
7. Lubrication requirements.
8. Direction of rotation.
9. Owner's designated equipment number.

2.6.2 Lifting Eye Bolts

Provide removable lifting eye bolts attached to the baseplate.

2.6.3 Anchor Bolts

Provide size and location of anchor bolts

2.7 SPARE PARTS

Spare Parts and Special Tools: Furnish, suitably tag and mark, securely pack and crate in a hinged-cover box or boxes suitable for shipment and long-term storage, the following items:

1. For Each Pump:
 - a. Complete set gaskets.
 - b. Complete set keys, dowels, pins, etc.
2. For This Set of Pumps:
 - a. One complete set of any special tools required to dismantle or service pump.

3.0 EXECUTION

3.1 GENERAL

The manufacturer shall prepare the pumps, motor, and accessories for shipment and be responsible for them until they are received by the Contractor.

Pumps shall be shipped assembled.

Operation and Maintenance Manual shall be provided in accordance with Section 01330, Instructions and Manuals, and shall include a complete set of manufacturer's instructions covering storage, handling, installation, operation, lubrication, and maintenance.

3.2 QUALITY ASSURANCE AND QUALITY CONTROL

Work shall be performed in accordance with the approved Quality Plan. Refer to Section 01450, Contractor Quality Control.

Manufacturer shall be certified to ISO 9000/9001.

3.3 TESTS AND INSPECTIONS

3.3.1 Factory Tests

Hydrostatic Tests:

1. Hydrostatic test all pump assemblies.
2. Tests shall be in conformance with the test standards of the Hydraulic Institute.

Performance Tests:

1. Performance tests shall be conducted at the manufacturer's facilities on all bowl assemblies.
2. Tests shall be conducted using a lab motor or a job motor that has received complete tests.
3. Tests shall be in conformance with the test standards of the Hydraulic Institute.
4. Pumps shall be factory tested for conformance to the design point speed/flow/head/motor current/HP/power factor/efficiency values as submitted with the Bid. Throttle discharge to obtain a minimum of three data points for entire recommended operating range. Curve shall clearly show recommended operating range.
5. Test reports shall include test data sheets and curves of test results. Test data sheets shall be certified correct by a registered professional engineer.
6. Motors: Testing per Section 16220, Low-Voltage AC Induction Motors.

3.3.2 Field Quality Control

The installed pumps, including motors, shall be thoroughly inspected and certified as properly installed by the manufacturer's representative prior to startup in accordance with Section 01450, Contractor Quality Control.

3.3.2.1 Functional Tests

The manufacturer's representative shall check operation of each pump with regard to proper alignment, correct rotation, excessive or unusual noises, overheating, properly functioning lubrication system, and overall satisfactory performance.

All pumps shall demonstrate satisfactory operation without excessive noise, vibration, or overheating as specified in the HIS.

Any pump exhibiting characteristics in excess of the specified limits or failing to meet the specified operational requirements will be modified, repaired, or replaced by the manufacturer at no additional cost to the District.

3.3.2.2 Field Verification of Performance

In accordance with HIS standards.

Test each installed pump at full and reduced speeds to verify capacity and confirm operation over specified operating range. Use field pressure gages, canal flow meter, and drive data. Provide test report including inlet and outlet pressures, flow, and drive speed.

3.4 MANUFACTURER'S SERVICES

Manufacturer's Representative: Present at Site or classroom designated by Owner, for minimum person-days listed below, travel time excluded:

1. 1 person-day for inspection of equipment when being received by Owner.
2. 3 person-days for installation assistance and inspection.
3. 3 person-days for completion of Manufacturer's Certificate of Proper Installation and vibration, and functional testing.
4. 1/2 person-day for prestartup classroom or Site training.
5. 1 person-day for facility startup.
6. 1/2 person-day for post-startup training of Owner's personnel.

These services will be scheduled at the District's request.

Site visits for other purposes, e.g., to certify site conditions, mechanical installation, and electrical system installation, will not be counted toward these minimums.

3.5 MAINTENANCE SCHEDULE AND AGREEMENT

The pump/motor unit must be designed and warranted for scheduled maintenance procedures to be performed after first season of operation, and then according to manufacturer's written maintenance schedule. The pump manufacturer shall provide a 5-year preventative maintenance program as part of the Bid. This 5-year program shall include replacement and repair all items and fluids that become worn or require replacement as a result of normal operation, at no additional cost to the District. The program shall end on _____.

The 5-year preventative maintenance program shall include all labor and materials, provided by the Contractor, to complete the preventative maintenance work according to the manufacturer's written schedule. The pump manufacturer will be responsible for pulling the pump for maintenance purposes and shall coordinate this maintenance with the District.

The annual preventative maintenance program for vertical turbine pumps shall include the following minimum requirements:

1. Confirm proper operation of all motor protective devices.
2. Replace all oils and lubricating fluids that are recommended by manufacturer for annual replacement
3. Perform all annual maintenance functions, checks and replacements recommended by manufacturer.
4. Download pump operating history from MCC for prior year and provide concise report with charts and max/min data records for temperature, current, operating hours and other condition monitoring data.
5. Special requirement for year five (5) of preventative maintenance program: Contractor shall replace all oils and lubricating fluids.

3.6 SUPPLEMENTS

The supplements listed below are a part of this Specification.

1. Data Sheets: Motor.

INDUCTION MOTOR DATA SHEET

Project: Chelan Tailrace Pump Station

Owner: Chelan County PUD No. 1

Equipment Name: Pump 1 & Pump 2

Equipment Tag Number(s): P-101, & P-102

Type: Squirrel-cage induction meeting requirements of NEMA MG 1

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer.

Hazardous Location: Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark.

Motor Horsepower: 150

Guaranteed Minimum Efficiency at Full Load: percent

Voltage: 460

Guaranteed Minimum Power Factor at Full Load: percent

Phase: III

Service Factor (@ rated max. amb. temp.): 1.0

Frequency: 60 Hz

Enclosure Type: See Spec 16220

Synchronous Speed: 1,800 rpm

Multispeed

Thermal Protection: See Spec 16220

Mounting Type: Vertical

Space Heater: See Spec 16220

Vertical Shaft: Solid Hollow

Vertical Thrust Capacity (lb): Up Down

Adjustable Speed Drive: See Section 16260, Low Voltage Adjustable Frequency Drive Systems.

 Operating Speed Range: to % of Rated Speed

 X Variable Torque

 Constant Torque

Additional Motor Requirements: See Section 16220, Low Voltage AC Induction Motors.

Special Features:

INDUCTION MOTOR DATA SHEET

Project: Chelan Tailrace Pump Station

Owner: Chelan County PUD No. 1

Equipment Name: Pump 3, Pump 4, Pump 5

Equipment Tag Number(s): P-103, P-104, P-105

Type: Squirrel-cage induction meeting requirements of NEMA MG 1

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer.

Hazardous Location: Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark.

Motor Horsepower: 150 Guaranteed Minimum Efficiency at Full Load: percent

Voltage: 460 Guaranteed Minimum Power Factor at Full Load: percent

Phase: III Service Factor (@ rated max. amb. temp.): 1.15

Frequency: 60 Hz Enclosure Type: See Spec 16220

Synchronous Speed: 1,800 rpm Constant Speed

Thermal Protection: See Spec 16220 Mounting Type: Vertical

Space Heater: See Spec 16220 Vertical Shaft: Solid Hollow

Vertical Thrust Capacity (lb): Up Down

Adjustable Speed Drive: See Section 16260, Low Voltage Adjustable Frequency Drive Systems.

 Operating Speed Range: to % of Rated Speed

 X Variable Torque

 Constant Torque

Additional Motor Requirements: See Section 16220, Low Voltage AC Induction Motors.

Special Features:

END OF SECTION 11215

SECTION 11305

SUBMERSIBLE MOTOR-DRIVEN PUMPS

TABLE OF CONTENTS

1.0	GENERAL	2
1.1	SECTION INCLUDES	2
1.2	REFERENCES	2
1.3	INFORMATION TO BE SUPPLIED WITH BID	2
1.4	CONTRACT SUBMITTALS	3
2.0	PRODUCTS	4
2.1	GENERAL	4
2.2	NAMEPLATES	4
2.3	PUMP OPERATING CONDITIONS	4
2.4	PUMP EQUIPMENT	5
2.5	SPARE PARTS	8
3.0	EXECUTION	8
3.1	GENERAL	8
3.2	QUALITY ASSURANCE AND QUALITY CONTROL	8
3.3	TESTS AND INSPECTIONS	8
3.4	MANUFACTURERS' SERVICES	10
3.5	MAINTENANCE SCHEDULE AND AGREEMENT	10

SECTION 11305

SUBMERSIBLE MOTOR-DRIVEN PUMPS

1.0 GENERAL

1.1 SECTION INCLUDES

Requirements for designing, testing, and providing submersible, electric axial flow propeller pumps, suction piping, discharge cans, lifting assemblies, discharge can covers, and all accessories and appurtenances as shown on the Drawing and as specified herein. Pump installation, discharge piping, flap gates, and pump supports are not included in this contract.

See Section 16220 for motors, motor supports, and connection cables.
See Section 16700 for Instrumentation and Controls.

1.2 REFERENCES

The Work of this Section shall comply with the latest editions of the following references and codes as adopted by the District:

1. Uniform Mechanical Code (UMC).
2. Uniform Plumbing, Code (UPC).
3. Uniform Fire Code (UFC).
4. National Electrical Code (NEC).
5. Uniform Building Code (UBC).
6. American Iron & Steel Institute (AISI).
7. American Society for Testing and Materials (ASTM).
8. National Electrical Manufacturers' Association (NEMA).
9. Anti-Friction Bearing Manufacturers Association (AFBMA).
10. International Standards Organization (ISO) - ISO9001.
11. Hydraulic Institute Standards (HIS), Centrifugal Pumps.

1.3 INFORMATION TO BE SUPPLIED WITH BID

The pump manufacturer shall submit, with its bid:

1. Complete catalog information, descriptive literature and identification of materials of construction.
2. A certified performance curve for the proposed pump unit, based on the gross head conditions described in this Section and calculated. The curve shall include flow, head, brake horsepower requirement, overall efficiency, minimum required submergence with HIS margin, NPSH required including HIS margin, pump speed and electrical specifications, including power consumption, tolerances not exceeding those of Hydraulic Institute Test Standards, Level B, for centrifugal

pumps, for the pump over its entire range of operation, including the recommended range of stable operation, and shall include reduced speed curves at 10 percent increments and system curves.

3. Calculated pump suction and discharge head losses at the design point.
4. Suction can and piping dimensions and information.

1.4 CONTRACT SUBMITTALS

Submit in accordance with Section 01300, Administrative Requirements.

Submit the following detailed shop drawings as part of the first shop drawing submittal:

1. Certified dimensional outline and installation drawing plans and sections, with clearance requirements, lifting and support connections, and power cable routing.
2. Weight of each pump assembly and pump discharge can.
3. Impeller speed, number of blades and motor speed.

Submit the following detailed shop drawings as part of the second shop drawing submittal:

1. Detailed plan and cross-sectional drawings of the pump arrangement with key parts and materials of construction.
2. Complete description of all factory finish systems including materials data sheets.
3. Detailed cross-sectional drawing of the motor and pump assembly showing mechanical seal, pump bearings, and lubrication system.
4. Power and control wiring diagrams, including terminals and numbers.
5. Electrical drawings including circuit schematics, interconnection diagrams, and all information necessary for connection of motors and electrical and instrumentation components.
6. Complete detailed parts list.
7. Suggested spare parts list to maintain the equipment in service for a period of 1 year and 5 years. Include a list of special tools required for checking, testing, parts replacement, and maintenance with current price information.

Submit the following detailed shop drawings as part of the third shop drawing submittal:

1. Special shipping, storage and protection, and handling instructions.
2. Manufacturer's printed installation instructions.

Submit the following shop drawings as part of the fourth shop drawing submittal:

1. Certified factory inspection report for all pumps.
2. Certified factory test reports for production test pumps.
3. Operation and Maintenance Manuals including complete operating instructions, maintenance requirements and schedules, copies of all shop drawings, parts

lists, catalog cut data, and complete part numbers for all purchased items. Provide separate O&M manuals for pumps, and electrical power system (five copies).

Submit the following data 30 days prior to request for final payment:

1. Certified field test report.
2. As-constructed equipment drawings (to include any field changes).

2.0 PRODUCTS

2.1 GENERAL

2.1.1 Like Items of Equipment

Provide end products of one manufacturer in order to achieve standardization for appearance, operation, maintenance, spare parts, and manufacturer's service.

2.2 NAMEPLATES

Nameplates: Equipment nameplates of stainless steel shall be stamped and fastened to the equipment in accessible locations with stainless steel screws or drive pins. Nameplates shall contain the manufacturer's name, model, serial number, size, characteristics, and appropriate data describing the machine performance ratings.

2.3 PUMP OPERATING CONDITIONS

Service conditions under which the pumps will operate are as follows:

1. Number of Pumps: Five.
2. Liquid Pumped: Fresh water.
3. Design Liquid Temperature: 40 to 70 degrees F.
4. Pumping Cycle: Continuous during fish bypass season; shut down during remainder of year.
5. Minimum and Maximum Approach Water Depths and Pump Submergence as shown on Drawings.

Definition of Pump Operating Heads:

1. Pump Gross Head: The difference in water surface level between the pump exit well and pump approach well, measured in feet. Approach velocity head, exit velocity head, internal pump losses, fish screen losses, suction and discharge line losses, and flap gate losses are not included in the pump gross head.
2. Minimum Gross Head: The minimum expected gross head for normal pump operation.
3. Maximum Gross Head: the maximum expected gross head for normal pump operation.

4. Design Gross Head: The expected nominal gross head for pump operation. This head condition will be the primary basis for pump hydraulic design.
5. Pump Total Dynamic Head (TDH): As defined by the Hydraulic Institute, Centrifugal Pumps, Test Standards.

The pumps shall meet the following performance requirements:

1. Clean Water Pumping Capacity: The pumps shall operate smoothly, without vibration or surges over a gross head range of 15.4 to 12.0 feet. In the overall project, the District must meet specific flow approach and exit velocity criteria to satisfy regulatory and environmental constraints on the project. Therefore, the pump equipment shall be designed to perform within the following flow and head ranges:
 - a. Pump Gross Head (ft): 15.4
 - b. Design Flow at Pump Gross Head (5 pumps): 260 cfs.
 - c. Pump Gross Head at Best Efficiency Point (ft): 13.8.
2. Maximum Propeller Speed: 880 rpm.
3. NPSH Margin: _____

2.4 PUMP EQUIPMENT

2.4.1 Materials

Propeller	Cast stainless steel, ASTM A743 CA6NM or aluminum bronze ASTM B148
Propeller Shaft	Stainless steel, ASTM A276, Type 420
O-Rings	Nitrile butadiene rubber (NBR) or Viton
Fasteners	Stainless steel, ASTM A276 Type 316
Outer Seal Faces	Silicon carbide or tungsten carbide
Inner Seal Faces	Silicon carbide or tungsten carbide
Pump Casing	Fabricated steel, cast steel or cast iron
Pump Support Cable	Stainless steel, ASTM A276 Type 316
Oil (seal lubrication)	FDA approved, vegetable or paraffin base
Pump Discharge Can	Fabricated steel, ASTM A242/588

2.4.2 Pump Construction

2.4.2.1 Pump Type

Each pump shall be of the close-coupled, submersible type, with motor connected to the propeller via a speed-reducing gearbox. All components of the pump, including motor, shall be capable of continuous underwater operation with the pump impeller completely submerged.

2.4.2.2 Surface Finish

Major pump components shall be fabricated steel, Type 316 stainless steel, or cast iron as specified herein. All hydraulic passages shall have smooth surfaces devoid of blow holes and other irregularities. All exposed nuts and bolts shall be stainless steel. Fabricated steel components shall be painted as specified in Section 09902, Painting.

2.4.2.3 Pump Impeller

All surfaces of the impeller exposed to water shall be corrosion resistant and smoothly contoured. The geometry and hydraulic design of the impeller shall be based on a scale model or prototype impeller with hydraulic performance certified by laboratory or field tests. Impellers fabricated from steel plate or uniform-thickness castings will not be accepted.

2.4.2.4 Mating Surfaces

All mating surfaces where watertight sealing is required shall be machined to provide a fully watertight metal-to-metal seal and fitted with nitrile rubber O-rings .

2.4.2.5 Shafts

Pump and motor shafts shall be of stainless steel as specified. The pump shafts shall rotate on permanently lubricated bearings.

2.4.2.6 Bearings

Bearings shall be needle, roller, or tapered roller type. Bearing sets shall be single row or double row as needed to provide the specified B10 life. The motor shaft shall be supported by two bearing sets sized to provide a B10 life of 100,000 hours at all anticipated axial and radial loading. Motor shaft bearings shall be provided with relubrication ports with positive anti-leak plugs for periodic addition of lubrication from external to the pump motor. The propeller shaft shall be supported by two additional bearing sets sized to provide a B10 life of 100,000 hours. The reduction gear shaft shall be supported by two additional bearing sets sized to provide a B10 life of 100,000 hours..

2.4.2.7 Shaft Seals

Two totally independent mechanical shaft seals, each with its own independent spring system, shall seal the propeller shaft seal at the water interface. The outer mechanical seal shall be protected from solids in the pumped media by a labyrinth cast into the propeller hub/seal housing interface. An oil-filled chamber with drain and inspection plug (each with positive anti-leak seal) shall separate the seals and provide lubrication. All seal faces shall be suitable for relapping. Single mechanical seals or rotary lip seals shall not be considered adequate for the pump shaft seal.

2.4.2.8 Pump Casing

Each pump shall be supplied with a substantial metal discharge casing with integral, internal pump stay vanes, and external connections to the pump assembly support frame. The stay vanes shall rigidly hold the pump motor, gearbox, and propeller in its true position under all operating conditions. External connections to the pump assembly support frame shall incorporate vibration dampening elastomeric rubber or wire rope cable attachments. If the pump is of the upstream motor configuration, the pump casing shall also include a discharge flange and connection hooks to securely attach the pump assembly to the pump station bulkhead structure. The hook and casing construction shall provide a secure connection to the bulkhead with minimal leakage of the pump discharge past the flange faces into the area surrounding the pump.

2.4.2.9 Pump Discharge Can

The pumping assembly shall be contained within a steel discharge housing manufactured of ASTM A242/588 (Corten equivalent) steel. The diameter of the discharge can shall be sufficient size to allow ready removal/reinsertion of the pump assembly. The housing shall support the weight of the pump by means of a full circumference steel support surface capable of bearing the weight of the pump and water pressure developed by the pump. The discharge housing shall have a continuous guide along its entire inside length to prevent the pump assembly from spinning during operation. Anti-rotation devices that do not run the entire length of the discharge housing will not be accepted.

The top of the discharge can assembly shall be flanged to mount a top plate adequately braced to withstand the water pressure developed by the pump. The top plate shall be equipped with a waterproof cable entry device to carry power and control cables through the top plate.

A 90 degree elbow shall be incorporated with each can to connect to the discharge piping. The bolt pattern shall be coordinated with the District and the pump manufacturer during production.

The discharge can housing and top plate shall be equipped with lifting loops or eyes for handling the can during installation.

The complete pump discharge housing shall be painted in accordance with Section 09902, Painting.

2.4.2.10 Suction Piping (Slant Model Only)

Suction piping and suction elbow.

2.4.2.11 4-Wheel Loading Chute (Slant Model Only)

2.4.2.12 Pump Sleeve (Slant Model Only)

2.5 SPARE PARTS

The following pump spare parts shall be included in the Bid and delivered with the final pump shipment:

1. One set of mechanical seals.
2. One set of pump and motor bearings.
3. Two sets of O-rings and gaskets.
4. One complete set of special tools required to dismantle pumps.

3.0 EXECUTION

3.1 GENERAL

Packaged Equipment: When any system is provided as prepackaged equipment, coordination shall include space and structural requirements, clearances, utility connections, signals, outputs, and features required by the manufacturer, including safety interlocks.

Pumps shall be shipped assembled.

Operation and Maintenance Manual shall be provided in accordance with Section 01330, Instructions and Manuals, and shall include a complete set of manufacturer's instructions covering storage, handling, installation, operation, lubrication, and maintenance.

3.2 QUALITY ASSURANCE AND QUALITY CONTROL

Work shall be performed in accordance with the approved Quality Plan. Refer to Section 01450, Contractor Quality Control.

Manufacturer shall be certified to ISO 9000/9001.

3.3 TESTS AND INSPECTIONS

3.3.1 Factory Tests

Prior to shipment, the pump manufacturer shall check each unit for proper balance and alignment, quiet vibration-free operation, and proper electrical characteristics.

Each pump shall receive the following tests, in addition to the manufacturer's normal quality assurance program:

1. Confirm static balance of pump impeller (prior to assembly).

2. Leakage from shaft seal.
3. Pumps shall be factory tested for conformance to the design point speed/flow/head/motor current/HP/power factor/efficiency values as submitted with the Bid. Throttle discharge to obtain a minimum of three data points for entire recommended operating range. Curve shall clearly show acceptable operating range. Adjust, realign, or modify units and retest in accordance with HIS if necessary.
4. Motor Tests, Including Operation of Over-Temperature and Leak Detection Devices: Per Section 16220, Low-Voltage AC Induction Motors.

Provide written certification of these tests to the Engineer prior to shipping the pumps.

Tests will be made in accordance with Hydraulic Institute, Centrifugal Pump Test Standards, Level B.

3.3.2 Field Quality Control

The installed pumps, including motors, shall be thoroughly inspected and certified as properly installed by the manufacturer's representative prior to startup in accordance with Section 01450, Contractor Quality Control.

3.3.2.1 Functional Tests

The manufacturer's representative shall check operation of each pump with regard to proper alignment, correct rotation, excessive or unusual noises, proper connection, and overall satisfactory performance.

All pumps shall demonstrate satisfactory operation without excessive noise, vibration, or overheating as specified in the HIS.

Any pump exhibiting characteristics in excess of the specified limits or failing to meet the specified operational requirements will be modified, repaired or replaced by the manufacturer at no additional cost to the District.

3.3.3 Performance Testing

In accordance with HIS standards.

Test each installed pump at full and reduced speeds to verify capacity and confirm operation over specified operating range. Use field pressure gages, canal flow meter, and drive data. Provide test report including inlet and outlet pressures, flow, and drive speed.

3.4 MANUFACTURERS' SERVICES

Manufacturer's Representative: Present at Site or classroom designated by Owner, for minimum person-days listed below, travel time excluded:

1. 1 person-day for inspection of equipment when being received by Owner.
2. 3 person-days for installation assistance and inspection.
3. 3 person-days for completion of Manufacturer's Certificate of Proper Installation and vibration, and functional testing.
4. 1/2 person-day for prestartup classroom or Site training.
5. 1 person-day for facility startup.
6. 1/2 person-day for post-startup training of Owner's personnel.

These services will be scheduled at the District's request.

Site visits for other purposes, e.g., to certify site conditions, mechanical installation, and electrical system installation, will not be counted toward these minimums.

3.5 MAINTENANCE SCHEDULE AND AGREEMENT

The pump/motor unit must be designed and warranted for scheduled maintenance procedures to be performed after first season of operation, and then according to manufacturer's written maintenance schedule. The pump manufacturer shall provide a 5-year preventative maintenance program as part of the Bid. This 5-year program shall include replacement and repair all items and fluids that become worn or require replacement as a result of normal operation, at no additional cost to the District. The program shall end on _____.

The 5-year preventative maintenance program shall include all labor and materials, provided by the Contractor, to complete the preventative maintenance work according to the manufacturer's written schedule. The District will provide its crane (with operators) for use in pump removal and reinstallation during normal business hours, provided that the Contractor shall reimburse the District for use of the crane. The annual preventative maintenance program for submersible pumps shall include the following minimum requirements:

1. Check all seal cavities for water intrusion and check the condition of the seals.
2. Replace all oils and lubricating fluids that are recommended by manufacturer for annual replacement
3. Confirm the proper operation of all level, leak detection and other protective devices.
4. Perform all annual maintenance functions, checks and replacements recommended by manufacturer.
5. Download pump operating history from MCC for prior year and provide concise report with charts and max/min data records for temperature, current, operating hours and other condition monitoring data.

6. Special requirement for year five (5) of preventative maintenance program:
Contractor shall replace all oils and lubricating fluids.

END OF SECTION 11305

SECTION 13020

FISH SCREENING SYSTEM

TABLE OF CONTENTS

1.0	GENERAL	2
1.1	SUMMARY	2
1.2	MANUFACTURERS	2
1.3	SUBMITTALS	2
1.4	DELIVERY, STORAGE, AND HANDLING OF EQUIPMENT AND MATERIALS	3
1.5	SPARE PARTS AND SPECIAL TOOLS	3
2.0	PRODUCTS	4
2.1	TEE-SCREENS (CYLINDRICAL)	4
2.2	FACTORY FINISHING	6
3.0	EXECUTION	6
3.1	FIELD FINISHING	6
3.2	FIELD QUALITY CONTROL	6
3.3	MANUFACTURER'S SERVICES	7

SECTION 13020

FISH SCREENING SYSTEM

1.0 GENERAL

1.1 SUMMARY

This section covers the work and materials necessary for the design, fabrication, delivery, startup assistance, and operation training for the river intake fish screens, compressed air backwash system, and related controls and accessories. The specific design and fabrication details for the fish screening system shall be the responsibility of the fish screen manufacturer. The Drawings and Specifications are provided to clarify their performance requirements contained in the section. Shop drawings shall be submitted as specified herein.

1.2 MANUFACTURERS

The fish screening system shall be designed, manufactured, and furnished by a single manufacturer with a minimum 5 years demonstrated experience with similar systems. Acceptable manufacturers: Hendrick Screen Co., Owensboro, KY; Johnson Screens, Mill Creek, WA; Cook Legacy, Atlanta, GA; or Intake Screen Inc., Sacramento, CA.

1.3 SUBMITTALS

1.3.1 Shop Drawings

Complete catalog information, descriptive literature, specifications, and identification of materials of construction for all items and equipment provided.

Intake Screens: Drawings showing screen diameter, screen length, assembly length, interface dimensions for outlet and air backwash dimensions, outlet size and slot opening, materials of construction and assembly weight.

Detailed mechanical and electrical drawings showing equipment dimensions, size, and locations of connections. Include weights of associated equipment.

Control panel layout and equipment arrangement drawings.

Wiring diagrams showing all control panel and field wiring connections.

Complete motor nameplate data, as defined by NEMA.

Power and control wiring diagrams.

Factory finish systems.

1.3.2 Quality Control Submittals

1.3.2.1 Operation and Maintenance Manuals

Contractor shall furnish an equipment Operation and Maintenance Manual. This manual shall include maintenance and operating instructions for all equipment and shall conform to Section 01450. The manual shall include, but not necessarily be limited to, the following items:

1. Equipment Manual:
 - a. Operation description and component list.
 - b. Description of operational tests.
 - c. General troubleshooting procedure.
 - d. Recommended spare parts list.
 - e. Electrical wiring diagrams.
 - f. Control panel drawings.
 - g. Control diagrams.
2. Preventive Maintenance and Lubrication Schedule.

1.3.3 Operating Instructions

The Contractor shall instruct the Owner on the operation and maintenance of all equipment and systems. Each piece of equipment shall be provided with a complete set of printed operation and maintenance instructions and control diagrams, as required above.

1.4 DELIVERY, STORAGE, AND HANDLING OF EQUIPMENT AND MATERIALS

Insofar as is practical, the equipment specified herein shall be factory assembled. The parts and assemblies that are, of necessity, shipped unassembled shall be packaged and tagged in a manner that will protect the equipment from damage and facilitate the final assembly in the field. Generally, machined and unpainted parts shall be protected from damage by the elements of weather with the application of a strippable protective coating.

1.5 SPARE PARTS AND SPECIAL TOOLS

One set compressor V-belts.

Three compressor intake filter cartridges.

One complete set of any special tools required to service the equipment.

2.0 PRODUCTS

2.1 TEE-SCREENS (CYLINDRICAL)

2.1.1 Fish Screen Type

Fish screens shall be the manufacturer's standard tee-screen product.

2.1.2 Configuration

Five tee-screens shall be positioned as shown on the Drawings.

2.1.3 Material

The intake screen material shall wedge-wire manufactured of a copper-nickel alloy or coated stainless steel specifically designed to resist biofouling. Manufacturer must demonstrate a minimum of five (5) years experience showing that the screen or coated screen material successfully provides zebra mussel protection.

The main outlet flange shall mate with a 42-inch flange with a flange pattern equal to AWWA C207, Class D and shall be stainless steel or approved copper-nickel alloy.

2.1.4 Dimensions

Each tee-screen shall be comprised of two 60-inch OD by 60-inch long wedge wire screen sections. Wire shall be 0.090 inch with 0.069 inch slots.

2.1.5 Hydraulic Design

Manufacturer shall certify the hydraulic design by confirming or making recommended changes to the dimensions marked with an asterisk on the Drawings. Provide certification by either CDF modeling or physical model study that the Manufacturer's standard tee-screen evenly distributes the approach velocity across the full face of the screens. Design internal hydraulic devices to ensure even distribution of flow and to guarantee that the total head loss from "river to flange" is 1.0 feet at a discharge of 58 cfs.

2.1.5 Structural Design

Design tee-screen to resist 10 feet of differential water pressure.

2.1.6 General

The screen cleaning system shall be designed by the Manufacturer to meet project objectives. Compressor shall be the screw type and the entire compressor assembly shall be contained in the Equipment Building as shown on the Drawings. The receiver manifold and air release valves will be outside the Equipment Building as shown on the Drawings. The air backwash system shall be capable of cleaning all five tee-screens within a 30-minute period.

2.1.7 Motor

Squirrel-cage type, with drip-proof enclosure, designed, manufactured, and tested in accordance with NEMA MG 1. Rating shall be as determined by Manufacturer. Motor shall be 1,800 rpm maximum, 480 volts, 3-phase, 60-Hz.

2.1.8 Moisture Traps

As required.

2.1.9 Backwash Control Valves

Furnish five fast acting valves mounted on the receiver manifold suitable for this application.

2.1.10 Instrumentation and Control

General:

1. Furnish all panels with the required logic and interfacing equipment, the final control elements, and all other hardware required for a complete and operable system. This includes all necessary engineering, furnishing, adjusting, testing, documenting, and starting up the air backwash system.
2. The air backwash control system shall control the air compressor, backwash control valves, and other equipment required to backwash the intake screen. Each cycle shall sequentially backwash the intake screen one at a time by discharging air through the respective backwash control valve, recharging the air receiver with the compressor, and then proceeding to the next screen until all screens are backwashed. The backwash cycle shall begin with the screen for pump 1 and proceed numerically to the last pump.

Screens shall be capable of being backwashed by any of the following methods:

1. At a present time each day.
2. By differential pressure across the screens. Signal shall be a contact closure rated 10 amps, 120V ac, provided under Section 16700, Pump Control Panel.
3. Manually.

Backwash Control Panel:

1. Furnish all conduit, conductors, and terminations between the backwash control panel and the control system in accordance with Division 16, Electrical. Then main power supply will be furnished under Division 16, Electrical.
2. The controls shall be housed in a NEMA 12 enclosure, located in the space indicated on the Drawings for the screen backwash system equipment.
3. The panel shall include, but not limited to, the following:
 - a. Controls for operating the air backwash control valves.

- b. Signals to actuate the compressor motor controls.
 - c. Individual valve position status.
 - d. Pilot light indicating compressor ON.
 - e. Pilot light indicating BACKWASH IN PROGRESS.
 - f. Pressure indicating dial indicating receiver pressure, range 0 to 250 psig.
4. Provide isolated relay contact for remote monitoring rated for 5.0 amp, 120V ac. Contact shall be normally open and close when the air backwash system is operating in Automatic mode.
5. Provide isolated relay contact for remote monitoring rated for 5.0 amp, 120V ac. Contact shall be normally closed and open upon an alarm condition.

2.1.11 Accessories

Equipment Identification Tag: 16-gauge aluminum or stainless steel with 1/4-inch die-stamped equipment tag number securely mounted in a readily visible location.

Lifting Lugs: Furnish all equipment or major equipment component weighing more than 100 pounds with suitable lifting lugs. Lifting lugs for tee-screens shall be designed specifically for the Manufacturer supplied rigging.

Rigging: Screen Manufacturer shall provide two sets of rigging to facilitate underwater installation of the tee-screens. Rigging shall be a three part sling to match three lifting lugs on the tee-screens so that when suspended the centerline of the discharge pipe on the tee-screen is horizontal. Terminate sling in a master link compatible with District's crane hook.

2.2 FACTORY FINISHING

Manufacturer's standard enamel finish.

3.0 EXECUTION

3.1 FIELD FINISHING

3.1.1 Factory Finished Equipment

Repair damaged surfaces using manufacturer's paint touchup kit.

3.2 FIELD QUALITY CONTROL

Prior to startup, all equipment shall be tested and inspected for proper alignment, quiet operation, proper connection, and satisfactory performance in conformance with Section 01661, Operational Acceptance Testing.

3.3 MANUFACTURER'S SERVICES

A manufacturer's representative for the equipment specified herein shall be present at the jobsite for a minimum of 1 person-day (travel time excluded) to provide certification of the installation and startup assistance.

END OF SECTION

SECTION 13121

PREFABRICATED BUILDINGS

TABLE OF CONTENTS

1.0	GENERAL	2
1.1	REFERENCES	2
1.2	GENERAL REQUIREMENTS	3
1.3	SYSTEM DESCRIPTION	3
1.4	SUBMITTALS	3
1.5	QUALITY ASSURANCE	5
1.6	DELIVERY, STORAGE, AND HANDLING	5
1.7	SPECIAL GUARANTEE AND WARRANTIES	6
2.0	PRODUCTS	6
2.1	BUILDING SYSTEM MANUFACTURERS	6
2.2	SYSTEM PERFORMANCE	7
2.3	COMPONENTS AND MATERIALS	7
2.4	SOURCE QUALITY CONTROL	11
3.0	EXECUTION	11
3.1	EXAMINATION	11
3.2	ASSEMBLY AND ERECTION	11
3.3	FIELD FINISHING	11
3.4	HEATING AND VENTILATING	12
3.5	ELECTRICAL SYSTEMS	12
3.6	FIELD QUALITY CONTROL	12
3.7	MANUFACTURER'S SERVICES	12
3.8	CLEANING/ADJUSTING	12
3.9	PROTECTION	13

SECTION 13121

PREFABRICATED BUILDINGS

1.0 GENERAL

1.1 REFERENCES

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

1. American Society of Civil Engineers (ASCE): 7, Minimum Design Loads for Buildings and Other Structures.
2. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE):
 - a. 90A, Energy Conservation in New Building Design.
 - b. Fundamentals Handbook.
3. ASTM International (ASTM):
 - a. A36, Structural Steel.
 - b. A123, Zinc Coatings on Products Fabricated from Rolled, Pressed and Forged Steel Shapes, Plates, Bars and Strip.
 - c. A153, Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - d. A193, Alloy-Steel and Stainless Steel Bolting Materials for High Temperature Service.
 - e. A615/A615M, Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 - f. C920, Standard Specification for Elastomeric Joint Sealants.
 - g. E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
 - h. E774, Standard Specification for the Classification of the Durability of Sealed Insulating Glass Units.
4. American Welding Society (AWS): AWS D1.1 (latest edition) Structural Welding Code – Steel and AWS D1.3 (latest edition) Structural Welding Code – Sheet Steel.
5. International Building Code (IBC): 2003 with amendments specified by the State of Washington.
6. National Fire Protection Association (NFPA):
 - a. 10, Portable Fire Extinguishers.
 - b. 13, Installation of Sprinkler Systems.
 - c. 70, National Electrical Code.
 - d. 90A, Standard for Installation of Air Conditioning and Ventilating Systems.
 - e. 90B, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.
 - f. 101, Life Safety Code.
7. Steel Door Institute (SDI): 100, Recommended Specifications, Standard Steel Doors and Frames.

1.2 GENERAL REQUIREMENTS

Building shall be completed and assembled with motor control centers and related electrical components at the factory.

Off-loading the building at the project site, installation and erection of the building will be by others. The manufacturer of the building shall coordinate delivery time and date with the Owner.

The metal building system covered under this Specification shall be provided by a single manufacturer and shall include all components and assemblies that form a complete insulated, weathertight building.

Building shall have structural steel main building frames, and secondary framing including purlins and girts, engineered and fabricated by the prefabricated building manufacturer. The building shall have vertical steel walls and a single-slope roof system including soffits, gutters, and downspouts. Roof slope shall be as shown on the Contract Drawings. The building shall be a single-span structure with continuous beam and column rigid frame. Exterior doors, windows, louvers and air conditioning shall be included in the metal building system.

1.3 SYSTEM DESCRIPTION

Building Name: Equipment Building.

1. General Arrangement: As shown on the Drawings or as needed to be compatible with the specified equipment supplied. Contractor shall review the Drawings and either confirm layout and dimensions, or provide information with his bid for changes needed in building size or layout.
2. Roof Slope: 6 inches vertical to 12 inches horizontal.
3. Include: Doors, windows, louvers, insulation, and roof accessories.

System: Design, and furnish complete building package using manufacturer's standard components. Installation will be by others.

Design: Coordinate enclosure design with electrical and other equipment to be enclosed.

Control indoor air quality and provide electrical illumination and power.

1.4 SUBMITTALS

1.4.1 Action Submittals

Shop Drawings:

1. Manufacturer's Standard Details and Structural Calculations: Clearly mark those portions that apply to specific Project and those parts that do not apply.

2. Manufacturer's Literature and Technical Data: Drawings and Specifications for proposed building system.
3. Structural Calculations stamped by a professional engineer registered in the State of Washington:
 - a. Complete analysis and design of structural components and connections in accordance with the design requirements indicated.
 - b. Consider prying action of bolts for bolted moment-resistant connections in primary framing.
 - c. Design column bases as pinned, unless specifically indicated otherwise.
4. Drawings Stamped by Contractor's Engineer: Drawings shall be specifically prepared for this Project. Show design load criteria, material specifications for framing members and connections, roof framing plan with dimensions and member sizes, and base plate details showing anchor bolt sizes, types, embedment depths, and bolt layout. Also show elevations of wall framing and bracing, instructions for temporary bracing, framing around roof and wall openings, details for joining and sealing of roof panels and wall cladding, and sections and details for all components and accessories.
5. Shop drawing shall clearly differentiate between shop and field welds. Show on a weld map complete information regarding base metal specification designation, location, type, size and extent of all welds with reference called out for Welding Procedure Specification (WPS) and Nondestructive (NDE) Testing requirements in tail of welding symbol.

Painting Systems: Specifications including paint manufacturer's name, product trade name, and preparation for shop and field coats.

Heat loss calculations showing conformance with applicable code.

Samples: Manufacturer's standard coating product data and colors. Owner will select colors.

1.4.2 Informational Submittals

Manufacturer's written instructions for shipping, handling, storage, protection and erection or installation of building and components.

AISC Quality Certification: AISC certificate showing name and address of manufacturer, effective date, and category of certification.

Certification that codes and referenced standards have been met and that the building was designed from a complete set of the Contract Drawings and Specifications.

Mill certifications for structural bolts, framing steel, roofing and siding, and steel wall liner panels.

Description and details of electrical continuity and grounding methods.

Test reports.

1.5 QUALITY ASSURANCE

1.5.1 Qualifications

Designer: Professional engineer registered in the State of Washington.

Manufacturer:

1. AISC Quality Certification: Metal Building Systems (MB).
2. Production capacity to provide work required for this Project without delay.

1.5.2 Regulatory Requirements

Design building system to meet requirements of:

1. 2003 International Building Code.
2. ASHRAE 90A, Energy Conservation in New Building Design.
3. Uniform Plumbing Code.
4. NFPA 101, Life Safety Code.
5. NFPA 70, National Electrical Code.

1.6 DELIVERY, STORAGE, AND HANDLING

Deliver building components in undamaged condition to Site only when ready for installation.

Protect building components and accessories from corrosion, deformation, and other damage during delivery, storage, and handling.

Store on wood blocking or pallets, flat and off ground, to keep clean and to prevent any damage or permanent distortion. Support bundles so there is no danger of tipping, sliding, rolling, shifting, or material damage. Cover with tarpaulins or other suitable weathertight ventilated covering.

Protect finish of metal panels by application of removable plastic film or other suitable material placed between panels. Do not allow panels to come in contact with other material that would result in scratching, denting, staining, or other damage to the panel finish.

Handle products in accordance with manufacturers' instructions.

Building shall include motor control centers and pump control panel specified in Sections 16480 and 16700 as part of the final assembly.

1.7 SPECIAL GUARANTEE AND WARRANTIES

The metal building system, composed of framing and structural members, factory formed, prefinished, insulated roof and wall sandwich panels, prefinished standing seam metal roofing, gutters and downspouts, accessories, fasteners, trim and miscellaneous building closure items such as doors and windows (when furnished by the manufacturer) shall be warranted as described below against material and workmanship deficiencies, system deterioration caused by exposure to the elements and service design loads or leaks. Any emergency temporary repairs conducted by the Owner shall not negate the warranties.

Furnish manufacturer's extended guarantee or warranty, with Owner named as beneficiary, in writing, as special guarantee. Special guarantee shall provide for correction, or at the option of the Owner, removal and replacement of Work specified in this Specification section found defective during a minimum period of 5 years and as stated below after the date of Substantial Completion. Duties and obligations for correction or removal and replacement of defective Work as specified in the General Conditions.

Conditions:

1. Finish on metal roof and wall panels, flashing, and trim will not chalk, crack, check blister, peel, flake, chip, or lose adhesion for 5 years.
2. Roofing will remain weathertight for 20 years.

2.0 PRODUCTS

2.1 BUILDING SYSTEM MANUFACTURERS

Products of the following, meeting these Specifications, may be used on this Project:

1. Atkinson Industries, Inc.
2. Building Technologies Corporation.
3. Armco Building Systems.
4. Butler Manufacturing Co.
5. Garco Building Systems, Airway Heights, WA.
6. Nucor Building Systems, Waterloo, IN.
7. Star Building Systems, a Robertson Ceko Co., Oklahoma City, OK.
8. Varco-Pruden Metal Building Systems.
9. Modulaire Industries.

2.2 SYSTEM PERFORMANCE

2.2.1 Structural Loading

Design structure in accordance with ASCE 7 and the following design requirements:

1. Mechanical and Electrical Equipment Loads:
 - a. Purlins and Secondary Framing: As indicated on Drawings, minimum 10 pounds per square foot.
2. Snow Load:
 - a. Ground Snow Load (P_g): 25 pounds per square foot.
 - b. Exposure Coefficient (C_e): .9.
 - c. Importance Factor (I): 1.00.
3. Minimum Roof Live Load: 50 pounds per square foot.
4. Wind Load:
 - a. Basic Wind Speed: 85 miles per hour.
 - b. Exposure Category C.
 - c. Importance Factor, $I_w = 1.0$.
5. Seismic Loads:
 - a. Importance Factor (I_e): 1.00.
 - b. Seismic Design Category C. Site Class: B.
 - c. Building Classification II, Seismic Use Group I.
 - d. USGS 2002 Mapped Values: $S_s=.51$, $S_1=.17$, $S_{DS}=.34$, $S_{D1}=.11$, $I_e=1.0$.
 - e. Base Shear: $V=.10W$ (Strength Design).
6. In addition to ASCE 7 roof live loads, a minimum design concentrated load of 300 pounds shall be used to simulate a construction load on roof panels. The concentrated load shall be applied at the panel midspan and shall be resisted by a single metal roof sandwich panel, assumed to be acting as a beam. The undeformed shape of the panel shall be used to determine the section properties.
7. Electrical, grounding and lightning protection shall be provided in accordance with the National Electrical Code.

2.2.2 Outside Design Conditions

1. Temperature: Winter DB, 0 degree F; summer DB, 100 degrees F.

2.3 COMPONENTS AND MATERIALS

2.3.1 Foundation

The building will be placed on a structural concrete slab. Building anchorage and base plate requirements shall be designed and supplied by the prefabricated metal building Manufacturer for installation by Others.

2.3.2 Shell

Provide weathertight structure that has straight, plumb walls with square corners. Maximum deflection for wall and roof panels under applied live load, snow or wind loads

shall not exceed 1/180 of the span length. The design analysis shall establish that the roof, when deflected under loading combinations, shall not result in ponding. Maximum deflections shall be based on sheets continuous across two or more supports with sheets unfastened and fully free to deflect. The calculated deflection from the concentrated load shall not exceed 1/180 of the span length. The methods for resisting lateral loads shall be cross-bracing, rigid frames, or wind columns.

Supports for gutters and downspouts shall be designed for the anticipated loads. Roof draining system shall withstand rainfall intensity of 2 inches per hour, with 5-minute duration. Flashing, trim, metal closure strips and curbs, fascia, caps, diverters and similar metal accessories shall be the building manufacturer's standard products. Exposed metal accessories shall be finished to match the building finish. Molded closure strips shall be bituminous-saturated fiber, closed-cell or solid-cell synthetic rubber or neoprene, or polyvinyl chloride premolded to match configuration of the roofing or siding and shall not absorb or retain water.

Allowable Average Heat Loss: Minimum R-value of 20 hr/sq ft/degree F/Btu.

Furnish louvers or ventilators to ventilate space to meet building code requirements.

Slope roof to drain, as shown on Drawings. Length of sheets for standing seam roofing shall be sufficient to cover the entire length of any unbroken roof slope, no cross seams allowed. Width of sheets with seamed interlocking ribs shall provide not less than 12 inches of coverage in place. Roof deck assemblies shall be Class 90 as defined in UL 580. Exposed fasteners may not be used. Use concealed clip attachment only. Height of ribs at joint with adjacent roof sheets shall be the building manufacturer's standard for the indicated roof slope, but shall not be less than 1-1/4 inches.

2.3.3 Interiors, Windows, and Doors

Floor: Level, easy to clean, nonslip to wet, smooth rubber-sole shoes.

Walls: Vertical, smooth surface with minimum joints or seams. Insulated wall and roof panels shall be factory-fabricated units with insulating core between metal face sheets, securely fastened together and uniformly separated with rigid spacers, facing of steel or aluminum composition and gauge specified for covering, constructed in a manner that will eliminate condensation on the interior of the panel. Insulation shall be compatible with adjoining materials; nonrunning and nonsettling; capable of retaining its R-value for the life of the metal facing sheets; and unaffected by extremes of temperature and humidity. The assembly shall have a flame spread rating not higher than 75, and smoke developed rating not higher than 450 when tested in accordance with ASTM E84. The insulation shall remain odorless, free from mold, and shall not become a source of food and shelter for insects. Panels shall not be less than 8 inches wide and shall be in one piece for unbroken wall heights and roof span.

2.3.4 Heating and Air Conditioning

Air conditioner/heater units shall be commercial quality, wall-mount, installed with rain hood, supply and return air grills, wall-mount thermostat and built-in breaker, 480-volt, three-phase, capable of maintaining cooling season temperature at 80 degrees F and heating season temperature at 65 degrees F.

2.3.5 Fire Protection

Furnish dry chemical fire extinguishers in accordance with NFPA 10.

2.3.6 Electrical Systems

AC loadcenter, 120/240V ac, 100A main and 12 branch circuit breakers fed via a 15kVA transformer mounted above the loadcenter.

4-inch by 4-inch perimeter wireway conforming to NEMA 1.

Illumination Level: At 36 inches above floor, 30 foot-candles minimum from fluorescent luminaires, plus task lights where there are shadows of people or equipment from general lighting.

One single pole light switch mounted near door.

Minimum of four duplex receptacles inside and one weatherproof receptacles outside near equipment door.

Photocell-operated weatherproof light fixtures located near entrance doors with manual override switch.

Copper ground bus loop installed below floor and connected to two external NEMA 2-hole copper ground pads.

Metal structure and wall panels shall be joined in a manner that will ensure electrical continuity of members and panels.

2.3.7 Colors

As selected by Owner, including:

1. Exterior Shell.
2. Roof.
3. Interior Walls.

Ceiling: White.

2.3.8 Roofing

Standing seam metal with gutters and downspouts.

2.3.9 Sealant

Single part polyurethane or silicone meeting ASTM C920, Type S, Grade NS, Class 25.

2.3.10 Hollow Metal Doors, Frames, and Hardware

Size: As shown on Drawings or as required and submitted by Contractor. 1-3/4 inches thick.

Furnish pressed steel frames and full flush hollow metal doors meeting Steel Door Institute (SDI) 100, Grade II, Model 1, 18 gauge.

Furnish hardware including hinges, cylindrical lock sets keyed into Owner's existing system, automatic closing devices, full weatherstripping, and thresholds, as applicable. Locking hardware and hinges shall be stainless steel.

Hinged doors and frames shall receive a galvanic coating and factory primer and shall conform to grade and size as indicated. Field-finish coat doors and frames with two coats of gloss alkyd enamel. Exterior doors shall have top edges closed flush and sealed against water penetration.

Exterior Door Louvers: Vandal-resistant with 18- by 14-mesh screen.

2.3.11 Aluminum Windows

Outward opening awning type, with aluminum frame with thermal break.

1. Exposed Surfaces: Finish in accordance with Aluminum Association Designation System for Aluminum Finishes, AA-M21C21A42; clear.
2. Screens: Furnish for operating sash.
3. Glass: ASTM E774 insulating glass, Class B.
4. Windows shall be furnished complete with operating and locking hardware, insulated (double) glazing, aluminum screened panels, weather stripping, framing, and fasteners to properly install the windows. Provide with drop-down crank or other suitable operators for operation at 6 feet, 0 inches above door.

2.3.12 Adjustable Louvers

Material: 20-gauge galvanized steel; factory finish to match wall panels.

Free Airflow: Minimum 50 percent.

Weather Projection: 60 percent or more.

Insect Screen: Manufacturer's standard 14- by 18-mesh.

2.3.13 Finishes

Coatings: Minimum two coats alkyd enamel on metal surfaces.

2.4 SOURCE QUALITY CONTROL

Inspections: Before shipment, inspect for complete, functional assembly.

Tests: Perform manufacturers' standard tests and adjustments on mechanical and electrical equipment and other moving and operating components. Perform functional testing of motor control and pump control systems prior to delivery to the project site.

3.0 EXECUTION

3.1 EXAMINATION

Examine Site and access to determine effect on proposed building. Make necessary field measurements.

3.2 ASSEMBLY AND ERECTION

Pre-engineered building shall be assembled and shipped with motor control centers specified in Section 16480, Motor Control Centers, and pump control panel specified in Section 16700, Pump Control Panel.

All welding shall be in conformance with the requirements of Section 05050.

Erect structural components in accordance with manufacturer's instructions. Securely anchor to concrete foundation.

Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of permanent, stable structure.

Install materials following manufacturers' instructions and recommendations.

3.3 FIELD FINISHING

Doors and Frames: Apply minimum two-coat paint system of alkydas specified in Section 09902, Painting.

Do not paint electrical equipment.

3.4 HEATING AND VENTILATING

Install equipment and components following manufacturer's instructions and recommendations.

Meet requirements of NFPA 90A and 90B.

Adjust for proper operation and control.

3.5 ELECTRICAL SYSTEMS

Meet requirements of National Electrical Code, NFPA 70.

Install products in accordance with manufacturers' instructions and recommendations.

Provide grounding for building by connecting to the substation ground grid.

3.6 FIELD QUALITY CONTROL

All field welding shall be performed in accordance with the requirements of Section 05050.

Functional Tests: Conduct on motor control centers, pump control panels, moving and operating components.

Performance Tests: Test and balance HVAC system.

Electrical Continuity: Test continuity of completed metal structure and installed equipment to ground.

3.7 MANUFACTURER'S SERVICES

Provide manufacturers' representatives at Site for installation assistance, inspection and certification of proper installation, equipment testing, startup assistance, and training of Owner's personnel for specified component, subsystem, equipment, or system.

3.8 CLEANING/ADJUSTING

Adjust moving and operating components for smooth operation.

Thoroughly clean interior and exterior of building and leave weathertight and ready for use.

Prior to startup, all equipment shall be inspected for proper alignment, quiet operation, proper connection, and satisfactory performance to ensure compliance with the performance requirements indicated. Any equipment that fails to meet any of the

contract specifications will be modified, repaired or replaced by the manufacturer at no additional cost to the Owner.

3.9 PROTECTION

Protect installed products from damage.

END OF SECTION 13121

SECTION 16010

BASIC ELECTRICAL REQUIREMENTS

TABLE OF CONTENTS

1.0	GENERAL	2
1.1	SECTION INCLUDES	2
1.2	REFERENCES	2
1.3	QUALITY ASSURANCE	2
1.4	CONTRACT DRAWINGS	3
1.5	SUBMITTALS	3
1.6	ENVIRONMENTAL CONDITIONS	4
1.7	PRODUCT DELIVERY, STORAGE, AND HANDLING	4
2.0	PRODUCTS	4
2.1	GENERAL	4
2.2	CORROSION PROTECTION AND PAINTING	5
2.3	EQUIPMENT VARIANCE FROM CONTRACT DOCUMENTS	5
3.0	EXECUTION	5
3.1	COORDINATION	5
3.2	TESTING	5

SECTION 16010

BASIC ELECTRICAL REQUIREMENTS

1.0 GENERAL

1.1 SECTION INCLUDES

Basic electrical requirements applicable to the Work and other sections of Division 16.

References.

Quality assurance.

Contract Drawings.

Submittals.

Environmental conditions.

Product delivery, storage, and handling.

1.2 REFERENCES

Conform to the following Codes and Standards, as applicable:

1. American National Standard Institutes (ANSI).
2. Canadian Standard Association (CSA).
3. Institute of Electrical and Electronic Engineers (IEEE).
4. Instrument Society of America (ISA).
5. Insulated Cable Engineer's Association (ICEA).
6. National Electrical Code (NEC).
7. National Electrical Manufacturers' Association (NEMA).
8. Underwriters' Laboratories, Inc. (UL).
9. National Electrical Safety Code (NESC).

1.3 QUALITY ASSURANCE

Provide electrical equipment, materials, details of construction, and installation. Perform necessary tests, in conformity with NEC and UL as well as other codes, ordinances, or regulations as specified and that may otherwise apply.

Referenced codes and standards establish the minimum requirements for the Work. Wherever these Specifications require higher grades of materials or workmanship than required by the codes and standards, these Specifications apply.

Should the specified reference standards conflict with these Specifications, request clarification from the Owner before proceeding.

1.4 CONTRACT DRAWINGS

Contract Drawings are generally diagrammatic and the locations and physical sizes of equipment are approximate unless detailed or dimensioned.

1. Exact Placement and Routing of Cables and Raceways: Governed by structural conditions, physical interference, and location of electrical terminations on equipment.
2. Examine existing site conditions, structural and mechanical Contract Drawings and shop drawings of equipment, to determine exact routing and final termination for raceways and cables.
3. Adjust clearances, locations, and sizes based on actual equipment proposed, interfaced, or used.

1.5 SUBMITTALS

General: Submit in accordance with Section 01300, Administrative Requirements.

Shop drawings shall be prepared as follows:

1. Provide complete information prior to manufacture of major equipment, such as motor control centers, unit substation, panelboards, control panels, and any special electrical equipment.
2. Provide complete information, prior to manufacture, covering special controls, instrumentation, or similar systems.
3. Diagrams: Show power and control systems in detail.
4. Interconnection Diagrams: Submitted where not otherwise covered above.
5. Diagram Format:
 - a. Place rungs of elementary diagrams horizontally and number each line.
 - b. Symbols: ANSI Standards.
 - c. Cross reference contact locations by line numbers.
 - d. Describe switching functions (level, pressure, timing) clearly with the value of the switching point indicated. Provide each sensor, and control switch with a clear description and a contact development.
 - e. Coil and Indicating Lights: Provided with descriptive text to define operation.
 - f. Identify and number terminal points on elementary, internal, and interconnection diagrams.

Catalog Information shall include:

1. Product Data:
 - a. Names of manufacturers.
 - b. Identifying trade names.

- c. Model designations.
- d. Catalog cuts.
2. Endorse catalog cuts for the specific parts and ratings of the equipment being supplied, especially where multiple parts and ratings appear on the same page.
3. Submit information on major equipment and panels at least 3 months prior to the scheduled incorporation of the equipment in the Work.

Test Reports: Submitted as specified.

Closeout Submittals: Submitted in accordance with Division 1 and as follows:

1. Operations and Maintenance Manuals.
2. Construction record drawings showing as-built conditions.

1.6 ENVIRONMENTAL CONDITIONS

Equipment supplied under this Division shall be suitable for operation under the following site conditions:

1. Extreme High Temperature: 107 degrees F.
2. Extreme Low Temperature: Minus 20 degrees F.
3. Humidity: 10 percent to 100 percent, noncondensing.
4. Maximum Wind Speed: 70 mph.
5. Elevation: 725 Ft AMSL.
6. Seismic Zone: UBC 2b.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

Provide in accordance with Division 1 and as follows:

1. Protect materials and equipment from dust and moisture prior to and during construction.
2. Repair by spray painting, after properly preparing the surface, scratches, or defects in the finish of the equipment, per requirements of Section 09902, Painting. Use only identical paint furnished by the equipment manufacturer for such purposes.

2.0 PRODUCTS

2.1 GENERAL

Use new materials of current manufacture.

Use same manufacture and quality for each type of material incorporated into the Work.

Furnish products UL-listed and UL-labeled for the purpose for which they are intended, where such listing exists. If no such listing exists, the CSA or other approved third-party listing and labeling will be acceptable.

2.2 CORROSION PROTECTION AND PAINTING

Treat equipment and appurtenances furnished under Division 16 with zinc phosphase, bonderize or otherwise give a rust preventive treatment, then prime and paint with a durable lead-free enamel finish or not less than 5 mils. total dry film thickness. Final finish unless otherwise specified as follows:

1. Exterior: ANSI 61 Light Gray.
2. Interiors: Manufacturer's standard.

Conform hot-dip galvanizing, where specified, to the applicable requirements of ASTM A123, A153, and A385. Coat field cuts of hardware and minor damage of the galvanized surface with Galv-Bar galvanizing repair system.

Provide stainless steel hardware for electrical devices and equipment installed out of doors, below grade, or in other damp locations.

2.3 EQUIPMENT VARIANCE FROM CONTRACT DOCUMENTS

If the equipment proposed for use in the Work differs in control circuitry, or if the equipment is of different horsepower than that shown on the Contract Drawings, furnish and install the controls and wiring properly to serve the proposed equipment.

1. Submit information prior to installation showing the complete system.
2. Mark final sizing of revised or added conductors and raceways after completing the required diagrams and determining the exact conductor count.

3.0 EXECUTION

3.1 COORDINATION

Coordinate electrical design work with others where equipment is to be interconnected.

3.2 TESTING

Furnish labor, materials, instruments, and tools as required for testing. Demonstrate that equipment is operating as intended prior to the acceptance of the Work. Protective devices are to be operative during testing of equipment. Notify the Owner 24 hours in advance of the tests.

Correct deficiencies or unsatisfactory conditions in a satisfactory manner, at no additional cost to the Owner.

Record and submit to Owner, in report form, the detailed results of each of the tests.

Make a phase rotation check to demonstrate that essential service feeders, main power feeders, three-phase power receptacles and motors have the same A-B-C phase rotation.

Test miscellaneous equipment by operating electric motors, relays, switches, and heater sufficiently to demonstrate their intended function and electrical connections.

END OF SECTION

SECTION 16220

LOW-VOLTAGE AC INDUCTION MOTORS

TABLE OF CONTENTS

1.0	GENERAL	2
1.1	RELATED SECTIONS	2
1.2	REFERENCES	2
1.3	DEFINITIONS	3
1.4	SUBMITTALS	3
2.0	PRODUCTS	4
2.1	MANUFACTURERS	4
2.2	GENERAL	5
2.3	HORSEPOWER RATING	5
2.4	SERVICE FACTOR	5
2.5	VOLTAGE AND FREQUENCY RATING	5
2.6	EFFICIENCY AND POWER FACTOR	6
2.7	LOCKED ROTOR RATINGS	6
2.8	INSULATION SYSTEMS	6
2.9	ENCLOSURES	7
2.10	TERMINAL (CONDUIT) BOXES	7
2.11	BEARINGS AND LUBRICATION	7
2.12	NOISE	8
2.13	BALANCE AND VIBRATION CONTROL	8
2.14	EQUIPMENT FINISH	8
2.15	SPECIAL FEATURES AND ACCESSORIES	9
2.16	SPECIAL MOTORS	10
2.17	FACTORY TESTING	12
3.0	EXECUTION	13
3.1	INSTALLATION	13
3.2	MANUFACTURER'S SERVICES	13
3.3	SUPPLEMENTS	13

SECTION 16220

LOW-VOLTAGE AC INDUCTION MOTORS

1.0 GENERAL

1.1 RELATED SECTIONS

This section applies only when referenced by a motor-driven equipment specification. Application, horsepower, enclosure type, mounting, shaft type, synchronous speed, and any deviations from this section will be listed in the equipment specification. Where such deviations occur, they shall take precedence over this section.

1.2 REFERENCES

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

1. American Bearing Manufacturers Association (ABMA):
 - a. 9, Load Ratings and Fatigue Life for Ball Bearings.
 - b. 11, Load Ratings and Fatigue Life for Roller Bearings.
2. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
 - a. 85, Test Procedure for Airborne Sound Measurements on Rotating Electric Machinery.
 - b. 112, Standard Test Procedures for Polyphase Induction Motors and Generators.
 - c. 114, Standard Test Procedures for Single-Phase Induction Motors.
 - d. 620, Guide for the Presentation of Thermal Limit Curves for Squirrel Cage Induction Motors.
 - e. 841, Standard for Petroleum and Chemical Industry – Severe Duty Totally Enclosed Fan-Cooled (TEFC) Squirrel Cage Induction Motors – up to and Including 500 hp.
3. National Electrical Manufacturers Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1,000 Volts Maximum).
 - b. C50.41, Polyphase Induction Motors for Power Generating Stations.
 - c. MG 1, Motors and Generators.
 - d. MG 13, Frame Assignments for Alternating Current Integral Horsepower Induction Motors.
4. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).
5. Underwriters Laboratories (UL):
 - a. 1, Flexible Metal Conduit.
 - b. 674, Standard for Safety Electric Motors and Generators for use in Division 1 Hazardous (Classified) Locations.
 - c. 2111, Overheating Protection for Motors.

1.3 DEFINITIONS

CISD-TEFC: Chemical industry, severe-duty enclosure.

DIP: Dust-ignition-proof enclosure.

EXP: Explosion-proof enclosure.

ODP: Open drip-proof enclosure.

TEFC: Totally enclosed, fan cooled enclosure.

TENV: Totally enclosed, nonventilated enclosure.

WPI: Open weather protected enclosure, Type I.

WPII: Open weather protected enclosure, Type II.

Motor Nameplate Horsepower: That rating after any derating required to allow for extra heating caused by the harmonic content in the voltage applied to the motor by its controller.

Inverter Duty Motor: Motor meeting all applicable requirements of NEMA MG 1, Section IV, Parts 30 and 31.

1.4 SUBMITTALS

1.4.1 Action Submittals

Descriptive information.

Nameplate data in accordance with NEMA MG 1.

Additional Rating Information:

1. Service factor.
2. Locked rotor current.
3. No load current.
4. Adjustable frequency drive motor load classification (e.g., variable torque) and minimum allowable motor speed for that load classification.
5. Guaranteed minimum full load efficiency and power factor.

Enclosure type and mounting (e.g., horizontal, vertical).

Dimensions and total weight.

Conduit box dimensions and usable volume as defined in NEMA MG 1 and NFPA 70.

Bearing type.

Bearing lubrication.

Bearing life.

Space heater voltage and watts.

Description, ratings, and wiring diagram of motor thermal protection.

Motor sound power level in accordance with NEMA MG 1.

Maximum brake horsepower required by the equipment driven by the motor.

Description and rating of submersible motor moisture sensing system.

1.4.2 Informational Submittals

Factory test reports.

Operation and Maintenance Data: As specified in Section 01300, Administrative Requirements.

2.0 PRODUCTS

2.1 MANUFACTURERS

General Electric.

Reliance Electric.

MagneTek.

Siemens Energy and Automation, Inc., Motors and Drives Division.

Baldor.

U.S. Electrical Motors.

TECO-Westinghouse Motor Co.

Toshiba International Corp., Industrial Division.

WEG Electric Motors Corp.

2.2 GENERAL

For multiple units of the same type of equipment, furnish identical motors and accessories of a single manufacturer.

In order to obtain single source responsibility, utilize a single supplier to provide a drive motor, its driven equipment, and specified motor accessories.

Meet requirements of NEMA MG 1.

Frame assignments in accordance with NEMA MG 13.

Motors shall be specifically designed for the use and conditions intended, with a NEMA design letter classification to fit the application.

Lifting lugs on all motors weighing 100 pounds or more.

Operating Conditions:

1. Maximum ambient temperature not greater than 50 degrees C.
2. Motors shall be suitable for operating conditions without any reduction being required in the nameplate rated horsepower or exceeding the rated temperature rise.
3. Overspeed in either direction in accordance with NEMA MG 1.

2.3 HORSEPOWER RATING

As designated in motor-driven equipment specifications.

Constant Speed Applications: Brake horsepower of the driven equipment at any operating condition not to exceed motor nameplate horsepower rating, excluding any service factor.

Adjustable Frequency and Adjustable Speed Applications (Inverter Duty Motor): Driven equipment brake horsepower at any operating condition not to exceed motor nameplate horsepower rating, excluding any service factor.

2.4 SERVICE FACTOR

Inverter-duty Motors: 1.0 at rated ambient temperature, unless otherwise noted.

Other Motors: 1.15 minimum at rated ambient temperature, unless otherwise noted.

2.5 VOLTAGE AND FREQUENCY RATING

System Frequency: 60 Hz.

Voltage Rating: Unless otherwise indicated in motor-driven equipment specifications:

Size	Voltage	Phases
1/2 hp and smaller	115	1
3/4 hp through 400 hp	460	3

Suitable for full voltage starting.

100 hp and larger shall be reduced voltage starting with 65 or 80 percent voltage tap settings on reduced inrush motor starters and solid state starters.

Suitable for accelerating the connected load with supply voltage at motor starter supply terminals dipping to 90 percent of motor rated voltage.

2.6 EFFICIENCY AND POWER FACTOR

For all motors except single-phase, under 1 hp, multispeed, short-time rated and submersible motors, or motors driving gates, valves, elevators, cranes, trolleys, and hoists:

1. Efficiency:
 - a. Tested in accordance with NEMA MG 1, Paragraph 12.59.
 - b. Guaranteed minimum at full load in accordance with NEMA MG 1 Table 12-11, Full-load Efficiencies of Energy Efficient Motors, or as indicated in motor-driven equipment specifications.
2. Power Factor: Guaranteed minimum at full load in accordance with Table 1 or as indicated in motor-driven equipment specifications.

2.7 LOCKED ROTOR RATINGS

Locked rotor kVA Code F or lower, if motor horsepower not covered by NEMA MG 1 tables.

Safe stall time 12 seconds or greater.

2.8 INSULATION SYSTEMS

2.8.1 Single-Phase, Fractional Horsepower Motors

Manufacturer's standard winding insulation system.

2.8.2 Three-Phase and Integral Horsepower Motors

Unless otherwise indicated in motor-driven equipment specifications, Class F with Class B rise at nameplate horsepower and designated operating conditions.

2.9 ENCLOSURES

Enclosures to conform to NEMA MG 1.

TEFC and TENV: Furnish with a drain hole with porous drain/weather plug.

Submersible: In accordance with Article Special Motors.

2.10 TERMINAL (CONDUIT) BOXES

Oversize main terminal boxes for all motors.

Diagonally split, rotatable to each of four 90-degree positions. Threaded hubs for conduit attachment.

Except ODP, furnish gaskets between box halves and between box and motor frame.

Minimum usable volume in percentage of that specified in NEMA MG 1, Section 1, Paragraph 4.19 and NFPA 70, Article 430:

Terminal Box Usable Values		
Voltage	Horsepower	Percentage
Below 600	15 through 125	500
Below 600	150 through 300	275

Terminal for connection of equipment grounding wire in each terminal box.

2.11 BEARINGS AND LUBRICATION

2.11.1 Horizontal Motors

3/4 hp and Smaller: Permanently lubricated and sealed ball bearings, or regreasable ball bearings in labyrinth sealed end bells with removable grease relief plugs.

1 through 400 hp: Regreasable ball bearings in labyrinth sealed end bells with removable grease relief plugs.

Minimum 100,000 hours L-10 bearing life for ball and roller bearings as defined in ABMA 9 and ABMA 11.

2.11.2 Vertical Motors

Thrust Bearings:

1. Antifriction bearing.
2. Manufacturer's standard lubrication 100 hp and smaller.

3. Oil lubricated 125 hp and larger.
4. Minimum 50,000 hours L-10 bearing life.

Guide Bearings:

1. Manufacturer's standard bearing type.
2. Manufacturer's standard lubrication 200 hp and larger.
3. Oil lubricated 250 hp and smaller.
4. Minimum 100,000 hours L-10 bearing life.

2.11.3 Regreasable Antifriction Bearings

Grease injection fittings and removable grease relief plugs: Readily accessible.

2.11.4 Oil Lubrication Systems

Oil reservoirs with sight level gauge.

Oil fill and drain openings with opening plugs.

Provisions for necessary oil circulation and cooling.

2.11.5 Bearing Isolation

Motors rated for inverter duty shall have electrically isolated bearings to prevent stray current damage.

2.12 NOISE

Measured in accordance with IEEE 85 and NEMA MG 1.

Motors controlled by adjustable frequency drive systems shall not exceed sound levels of 3 dBA higher than NEMA MG 1.

2.13 BALANCE AND VIBRATION CONTROL

In accordance with NEMA MG 1, Part 7.

2.14 EQUIPMENT FINISH

2.14.1 Protect Motor for Service Conditions

Other Enclosures: Outdoor industrial atmospheres, including moisture and direct sunlight exposure.

2.14.2 External Finish

Prime and finish coat manufacturer's standard.

2.14.3 Internal Finish

Bore and end turns coated with clear polyester or epoxy varnish.

2.15 SPECIAL FEATURES AND ACCESSORIES

2.15.1 Screen Over Air Openings

Stainless steel on motors with ODP, WPI, and WPII enclosures meeting requirements for Guarded Machine in NEMA MG 1, and attached with stainless steel screws.

2.15.2 Winding Thermal Protection

Thermostats:

1. Motors for constant speed application 1 hp through 75 hp.
2. Bi-metal disk or rod type thermostats embedded in stator windings.
3. Automatic reset contacts rated 120 volts ac, 5 amps minimum, opening on excessive temperature. (Manual reset shall be provided at motor controller.)
4. Leads extending to separate terminal box for motors 100 hp and larger.

Thermistors:

1. Motors for constant speed application 100 hp and larger. Motors for adjustable speed application 25 hp and larger.
2. Thermistor embedded in each stator phase winding before winding dip and bake process.
3. In intimate contact with winding conductors.
4. Epoxy-potted, solid state thermistor control module mounted in NEMA 250, Type 4 box on motor by motor manufacturer.
5. Individual thermistor circuits factory-wired to control module.
6. Control module rated for 120V ac power supply.
7. Control module automatically reset contact for external use rated 120 volts ac, 5 amps minimum, opening on abnormally high winding temperature. Manual reset shall be provided at motor controller.

2.15.3 Space Heaters

Provide winding space heaters with leads wired out to motor terminal box.

Provide extra hole or hub on motor terminal box as required.

Unless shown otherwise, heater shall be suitable for 120V ac supply, with wattage suitable for motor frame size.

2.15.4 Nameplates

Raised or stamped letters on stainless steel or aluminum.

Display motor data required by NEMA MG 1, Paragraph 10.39 and Paragraph 10.40 in addition to bearing numbers for both bearings.

Premium efficiency motor nameplates to also display NEMA nominal efficiency, guaranteed minimum efficiency, full load power factor, and maximum allowable kVAR for power factor correction capacitors.

2.15.5 Anchor Bolts

Provide anchor bolts meeting manufacturer's recommendations and of sufficient size and number for the specified seismic conditions.

2.16 SPECIAL MOTORS

2.16.1 General

Requirements in this article take precedence over conflicting features specified elsewhere in this section.

2.16.2 Inverter Duty Motor

Motor supplied power by adjustable voltage and adjustable frequency drives shall be inverter duty rated.

Motor shall be suitable for operation over entire speed range indicated.

Provide forced ventilation where speed ratio is greater than published range for motor being installed.

2.16.3 Submersible Pump Motor

Manufacturers:

1. MWI Pump.
2. ITT Flygt Corp.
3. ABS.

At 100 Percent Load:

Submersible Pump Motors		
Horsepower	Guaranteed Minimum Efficiency	Guaranteed Minimum Power Factor
5 through 10	80	82
10.1 through 50	85	82
50.1 through 100	87	82
Over 100	89	82

Insulation System: Manufacturer's standard Class B or Class F.

Motor capable of running dry continuously.

Enclosure:

1. Hermetically sealed, watertight, for continuous submergence up to 65-foot depth.
2. Listed to meet UL 674 and NFPA 70 requirements for Class I, Division 1, Group D hazardous atmosphere.
3. Seals: Tandem mechanical.

Bearing and Lubrication:

1. Permanently sealed and lubricated, replaceable antifriction guide and thrust bearings.
2. Minimum 15,000 hours L-10 bearing life.

Inrush kVA/horsepower no greater than NEMA MG 1 and NFPA 70, Code F.

Winding Thermal Protection:

1. Thermal sensor and switch assembly, one each phase, embedded in stator windings and wired in series.
2. Switches normally closed, open upon excessive winding temperature, and automatically reclose when temperature has cooled to safe operating level.
3. Switch contacts rated at 5 amps, 120V ac.

Motor Seal Failure Moisture Detection:

1. Probes or sensors to detect moisture beyond seals.
2. Probe or sensor monitoring module for mounting in motor controller, suitable for operation from 120V ac supply.

3. Monitoring module with control power transformer, probe test switch and test light, and two independent 120V ac contacts, one opening and one closing when the flux of moisture is detected.

Bearing Overtemperature Protection for Motors Larger than 100 hp:

1. Sensor on lower bearing housing monitoring bearing temperature.
2. Any monitoring relay necessary to provide 120V ac contact opening on bearing overtemperature.

Winding thermal protection, moisture detection, and bearing overtemperature specified above may be monitored by a single device providing two independent 120V ac contacts, one closing and one opening on malfunction.

Connecting Cables:

1. Two separate cables, one containing power and grounding conductors, and the other containing control and grounding conductors.
2. Each cable suitable for hard service, submersible duty with watertight seal where cable enters motor.
3. Length shall be sufficient to connect to junction box as shown on Contract Drawings.
4. UL 1 listed and sized in accordance with NFPA 70.

Inclined Motors:

1. Motors suitable for operation only in horizontal position not acceptable.
2. Bearings designed for thrust imposed by driven equipment and by motor rotor when motor is in inclined position.
3. Lubrication system designed to provide adequate bearing lubrication when motor is in inclined position.

2.17 FACTORY TESTING

2.17.1 Tests

In accordance with IEEE 112 for polyphase motors and IEEE 114 for single-phase motors.

Routine (production) tests on all motors in accordance with NEMA MG 1. Test multispeed motors at all speeds.

For energy efficient motors, test efficiency and power factor at 50, 75, and 100 percent of rated horsepower:

1. In accordance with IEEE 112, Test Method B, and NEMA MG 1, Paragraph 12.59 and Paragraph 12.60.

2. On motors of 100 hp and smaller, furnish a certified copy of a motor efficiency test report on an identical motor.

Provide certified test reports for polyphase motors 100 hp and larger.

2.17.2 Test Report Forms

Routine Tests: IEEE 112, Form A-1.

Efficiency and power factor by Test Method B, IEEE 112, Form A-2, and NEMA MG 1, Table 12-11.

3.0 EXECUTION

3.1 INSTALLATION

In accordance with manufacturer's instructions and recommendations.

Align motor carefully and properly with driven equipment.

Secure equipment to mounting surface with anchor bolts.

3.2 MANUFACTURER'S SERVICES

Furnish manufacturer's representative at Site in accordance with Section 01460, Inspections and Tests, and Section 01661, Operational Acceptance Testing, for installation assistance, inspection, equipment testing, and startup assistance for motors larger than 100 hp.

Manufacturer's Certificate of Proper Installation.

3.3 SUPPLEMENTS

Table supplement, following "End of Section," is part of this Specification.

1. Table 1, Motor Performance Requirements.

END OF SECTION 16220

**TABLE 1
MOTOR PERFORMANCE REQUIREMENTS**

hp	Nom. Speed rpm	% Guar. Min. Full Load Efficiency				% Guar. Min. Full Load Power Factor			
		Horizontal		Vertical		Horizontal		Vertical	
		Drip-Proof ODP	TEFC	Drip-Proof ODP	TEFC	Drip-Proof ODP	TEFC	Drip-Proof ODP	TEFC
1	1,800	82.5	82.5			Mfr.'s Std.	Mfr.'s Std.		
	1,200	80.0	80.0			Mfr.'s Std.	Mfr.'s Std.		
1.5	3,600	82.5	82.5			Mfr.'s Std.	Mfr.'s Std.		
	1,800	84.0	84.0			Mfr.'s Std.	Mfr.'s Std.		
	1,200	84.0	85.5		82.0	Mfr.'s Std.	Mfr.'s Std.		Mfr.'s Std.
2	3,600	84.0	84.0			Mfr.'s Std.	Mfr.'s Std.		
	1,800	84.0	84.0			Mfr.'s Std.	Mfr.'s Std.		
	1,200	85.5	86.5	83.7	83.7	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
3	900	82.9	82.5	82.9	81.7	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	3,600	84.0	85.5	82.0	82.0	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	1,800	86.5	87.5	84.8	84.8	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	1,200	86.5	87.5	87.5	86.6	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	900	84.1	83.0	84.1	82.9	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.

**TABLE 1
MOTOR PERFORMANCE REQUIREMENTS**

hp	Nom. Speed rpm	% Guar. Min. Full Load Efficiency				% Guar. Min. Full Load Power Factor			
		Horizontal		Vertical		Horizontal		Vertical	
		Drip-Proof ODP	TEFC	Drip-Proof ODP	TEFC	Drip-Proof ODP	TEFC	Drip-Proof ODP	TEFC
5	3,600	85.5	87.5	84.8	84.8	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	1,800	87.5	87.5	84.8	84.8	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	1,200	87.5	87.5	87.5	86.6	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	900	87.5	85.5	87.5	86.6	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
7.5	3,600	87.5	88.5	84.8	86.6	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	1,800	88.5	89.5	89.3	88.4	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	1,200	88.5	89.5	88.4	87.5	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	900	87.5	85.5	87.5	86.6	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
10	3,600	88.5	89.5	89.3	88.4	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	1,800	89.5	89.5	89.3	88.4	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	1,200	90.2	89.5	89.3	88.4	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	900	89.3	88.5	89.3	88.4	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.

**TABLE 1
MOTOR PERFORMANCE REQUIREMENTS**

hp	Nom. Speed rpm	% Guar. Min. Full Load Efficiency				% Guar. Min. Full Load Power Factor			
		Horizontal		Vertical		Horizontal		Vertical	
		Drip-Proof ODP	TEFC	Drip-Proof ODP	TEFC	Drip-Proof ODP	TEFC	Drip-Proof ODP	TEFC
15	3,600	89.5	90.2	88.4	88.4	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	1,800	91.0	91.0	90.9	90.2	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	1,200	90.2	90.2	90.2	89.3	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	900	89.3	88.5	89.3	88.4	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
20	3,600	90.2	90.2	90.9	89.3	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	1,800	91.0	91.0	91.7	90.9	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	1,200	91.0	90.2	90.2	89.3	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	900	90.2	89.5	89.3	88.4	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
25	3,600	91.0	91.0	91.7	90.2	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	1,800	91.7	92.4	92.4	91.7	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	1,200	91.7	91.7	90.9	89.3	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	900	90.2	89.5	89.3	88.4	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.

**TABLE 1
MOTOR PERFORMANCE REQUIREMENTS**

hp	Nom. Speed rpm	% Guar. Min. Full Load Efficiency				% Guar. Min. Full Load Power Factor			
		Horizontal		Vertical		Horizontal		Vertical	
		Drip-Proof ODP	TEFC	Drip-Proof ODP	TEFC	Drip-Proof ODP	TEFC	Drip-Proof ODP	TEFC
30	3,600	91.0	91.0	89.5	88.4	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	1,800	92.4	92.4	92.4	91.7	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	1,200	92.4	91.7	91.7	90.2	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
	900	91.7	91.0	90.9	90.9	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.	Mfr.'s Std.
40	3,600	91.7	91.7	90.2	89.3	86.6	86.1	87.0	89.0
	1,800	93.0	93.0	92.8	91.7	78.2	78.2	83.0	84.5
	1,200	93.0	93.0	91.7	90.9	81.5	81.5	81.5	81.5
	900	91.7	91.0	90.9	90.2	70.0	70.5	70.0	70.5
50	3,600	92.4	92.4	90.2	89.3	85.1	86.7	89.0	89.0
	1,800	93.0	93.0	92.8	91.7	79.5	79.4	82.5	82.5
	1,200	93.0	93.0	91.7	90.9	81.5	81.5	81.5	81.5
	900	91.7	91.7	90.9	90.9	78.5	72.9	78.5	80.0

**TABLE 1
MOTOR PERFORMANCE REQUIREMENTS**

hp	Nom. Speed rpm	% Guar. Min. Full Load Efficiency				% Guar. Min. Full Load Power Factor			
		Horizontal		Vertical		Horizontal		Vertical	
		Drip-Proof ODP	TEFC	Drip-Proof ODP	TEFC	Drip-Proof ODP	TEFC	Drip-Proof ODP	TEFC
60	3,600	93.0	93.0	91.7	90.9	85.8	88.3	87.5	89.0
	1,800	93.6	93.6	93.5	92.8	80.5	79.9	80.5	80.5
	1,200	93.6	93.6	92.8	91.7	81.5	81.5	81.5	81.5
	900	92.4	91.7	91.7	90.9	79.5	73.2	79.5	79.5
75	3,600	93.0	93.0	91.7	91.7	87.1	88.5	88.5	88.5
	1,800	94.1	94.1	93.5	93.5	81.0	81.5	81.0	81.5
	1,200	93.6	93.6	93.5	92.8	82.0	82.0	82.0	82.0
	900	92.8	92.4	92.8	91.7	80.5	74.5	80.5	81.0
100	3,600	93.0	93.6	91.7	91.7	87.0	88.2	87.0	88.5
	1,800	94.1	94.5	94.0	93.5	81.0	81.0	81.0	81.0
	1,200	94.1	94.1	92.8	92.8	82.1	81.7	85.5	85.5
	900	93.5	92.4	92.8	91.7	77.0	77.3	77.0	80.0

**TABLE 1
MOTOR PERFORMANCE REQUIREMENTS**

hp	Nom. Speed rpm	% Guar. Min. Full Load Efficiency				% Guar. Min. Full Load Power Factor			
		Horizontal		Vertical		Horizontal		Vertical	
		Drip-Proof ODP	TEFC	Drip-Proof ODP	TEFC	Drip-Proof ODP	TEFC	Drip-Proof ODP	TEFC
125	3,600	93.6	94.5	91.7	91.7	86.4	89.1	87.0	90.5
	1,800	94.5	94.5	93.5	92.8	85.4	85.5	87.5	86.0
	1,200	94.1	94.1	93.5	92.8	82.7	82.3	85.5	85.5
	900	93.5	93.0	92.8	92.4	78.5	78.5	78.5	78.5
150	3,600	93.6	94.5	92.4	91.7	86.5	90.0	86.5	90.5
	1,800	95.0	95.0	94.5	94.0	82.5	85.0	84.5	85.0
	1,200	94.5	95.0	93.5	94.0	81.5	81.5	81.5	81.5
	900	93.5	93.0	92.8	92.4	78.0	78.5	78.0	78.5
200	3,600	94.5	95.0	92.4	93.0	87.8	89.4	91.0	91.0
	1,800	95.0	95.0	94.0	94.0	85.2	86.5	87.0	87.0
	1,200	94.5	95.0	93.5	93.5	79.0	82.5	79.0	82.5
250	3,600	95.0	95.0	91.7	92.4	85.0	86.5	85.0	86.5
	1,800	96.0	96.0	94.5	94.5	79.0	79.0	79.0	79.0
	1,200	95.0	95.0	94.5	93.5	82.0	82.0	82.0	82.0

**TABLE 1
MOTOR PERFORMANCE REQUIREMENTS**

hp	Nom. Speed rpm	% Guar. Min. Full Load Efficiency			% Guar. Min. Full Load Power Factor		
		Horizontal		Vertical	Horizontal		Vertical
		Drip-Proof ODP	TEFC	Drip-Proof ODP	TEFC	Drip-Proof ODP	TEFC
300	3,600	95.0	95.0			89.8	89.9
	1,800	95.4	95.2	94.5	94.0	80.0	80.0
	1,200	95.0	95.0			84.5	90.1
350	3,600	95.0	95.0			89.4	85.9
	1,800	95.0	95.0			85.9	85.9
400	3,600	95.0	95.0			88.4	
	1,800	95.0	95.0			86.8	
450	3,600	95.0	95.0			89.1	
500	3,600	95.0	95.0			88.3	

SECTION 16260

LOW-VOLTAGE VARIABLE FREQUENCY DRIVE SYSTEM

TABLE OF CONTENTS

1.0	GENERAL	2
1.1	REFERENCES	2
1.2	DEFINITIONS	2
1.3	SYSTEM DESCRIPTION	3
1.4	SUBMITTALS	4
1.5	QUALITY ASSURANCE	6
1.6	EXTRA MATERIALS	6
2.0	PRODUCTS	7
2.1	MANUFACTURERS	7
2.2	SERVICE CONDITIONS	7
2.3	COMPONENTS	7
2.4	FACTORY FINISHING	12
2.5	SOURCE QUALITY CONTROL	12
3.0	EXECUTION	12
3.1	INSTALLATION	12
3.2	FIELD QUALITY CONTROL	13
3.3	MANUFACTURERS' SERVICES	14

SECTION 16260

LOW-VOLTAGE VARIABLE FREQUENCY DRIVE SYSTEM

1.0 GENERAL

1.1 REFERENCES

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

1. Electronic Industries Alliance (EIA), Telecommunications Industry Association (TIA): 359-1, Special Colors.
2. Institute of Electrical and Electronics Engineers (IEEE):
 - a. 112, Standard Test Procedure for Polyphase Induction Motors and Generators.
 - b. 519, Recommended Practices and Requirements for Harmonic Control in Electric Power Systems.
 - c. C62.41, Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.
3. National Electrical Manufacturer's Association (NEMA):
 - a. CP 1, Shunt Capacitors.
 - b. MG 1, Motors and Generators.
 - c. 250, Enclosures for Electrical Equipment (1,000 Volts Maximum).
 - d. WC-57, Control Cables.
4. National Fire Protection Association (NFPA): Electrical Standard for Industrial Machinery.

1.2 DEFINITIONS

Terms that may be used in this section:

1. AFD: Adjustable frequency drive.
2. CMOS: Complementary metal oxide semiconductor.
3. CSI: Current Source Inverter.
4. EMU: Energy monitoring unit.
5. GTO: Gate Turn-Off Thyristor.
6. MPR: Motor protection relay.
7. MTBF: Mean time between failure
8. PWM: Pulse width modulation.
9. ROM: Read only memory.
10. RTD: Resistance temperature detector.
11. RTU: Remote Telemetry Unit.
12. Rated Load: Load specified for the equipment.
13. Rated Speed: Nominal rated (100 percent) speed specified for the equipment.
14. TDD: Total demand distortion.

15. THD: Total harmonic distortion.

16. TTL: Transistor transistor logic.

1.3 SYSTEM DESCRIPTION

1.3.1 Performance Requirements

Composite drive/motor efficiency (CE) is defined as ratio of motor shaft kW to drive input kW. AFD system minimum composite efficiency requirements:

1. At 60-Hz drive output and 100 percent load, CE = 92 percent.
2. At 50-Hz drive output and 60 percent load CE = 89 percent.
3. At 40-Hz drive output and 30 percent load CE = 84 percent.
4. At 30-Hz drive output and 12.5 percent load CE = 77 percent.

Rated Continuous Operation Capacity: Not less than 1.15 times full load current rating of driven motor, as indicated on the motor nameplates, and suitable for continuous operation at any continuous overload which may be imposed on motor by driven pump operating over specified speed range.

Basis for Harmonic Computations: Using Simplified Pump Station One-Line Diagram for current and voltage distortion computations, furnish harmonic filters, line reactors, isolation transformers, or higher pulse converter arrangements required to meet current/voltage distortion limits.

Normal Source Current Harmonic Distortion:

1. Compute normal source individual and total current harmonic distortion at the location identified as input to main located in MCC, in accordance with IEEE Standard 519. Individual current harmonic distortion and the total demand distortion expressed as percent of maximum demand load current I_L shall not exceed values specified in Table 1 below:

Table 1	
Individual Harmonic Order (Odd Harmonics)	Harmonic Current Distortion Percent of Max. Demand Load Current I_L
$h < 11$	4.0
$11 \leq h < 17$	2.0
$17 \leq h < 23$	1.5
$23 \leq h < 35$	0.6
$35 \leq h$	0.3
Total Demand Distortion (TDD)	5.0

2. Limits specified in Table 1 are for drives utilizing 6-pulse rectifiers. Should manufacturer propose 12-pulse rectifiers, limits for characteristic harmonics can be increased by a factor of 1.41 times values listed in Table 1.

Furnish isolating transformers or series reactors, harmonic filters, or other devices necessary for proper system operation. Furnish necessary devices and circuits to prevent operation of one drive from adversely affecting operation of other drives supplied from same transformer or same bus.

When isolation transformers are used, design to meet K-factor requirements of drive(s) connected.

1.3.2 Design Requirements

Design and provide drive system consisting of adjustable frequency controller, drive motor, certain auxiliary items, and components necessary for complete operating system.

Other equipment is being powered from same bus as adjustable frequency drives. Ensure proper operation of drives and other loads under normal and emergency conditions.

Furnish AFDs rated on basis of actual motor full load nameplate current rating.

Drive System: Convert incoming three-phase, 60-Hz ac power to variable voltage, adjustable frequency output for adjustable speed operation of a standard ac induction squirrel-cage motor, using the pulse-width-modulation (PWM) technique to produce the adjustable frequency output.

System rated for continuous industrial duty and suitable for use with Standard NEMA MG 1, Design B motors.

Incoming Line Circuit Breaker: Provide positive means of disconnecting incoming power, and overcurrent protection for the drive system.

Incoming Line Reactor: Design to minimize harmonic distortion on the incoming power feeder.

1.4 SUBMITTALS

1.4.1 Action Submittals

Overall drive system operating data, including efficiencies, input currents, and power factors, at driven equipment actual load and rated system input voltage, at 0, 40, 60, 80, 100, and 110 percent of rated speed.

Individual and total harmonic content (voltage and current) reflected in system normal source supply at driven equipment actual load at 70 and 100 percent of rated speed at locations specified in Simplified Pump Station One-Line Diagram, and load conditions specified. Normal source system short-circuit available at drive shall be calculated from data furnished in. Use TDD and THD factors as defined in IEEE Standard 519 to designate total harmonic content.

AFD output pulse maximum peak voltage, pulse rise time and pulse rate of rise, including any justification for proposed deviation from specified values. Include motor manufacturer's certification that motor insulation will withstand long-term overvoltages caused at motor terminals due to specified output pulse data or any proposed deviation from this data.

Data on the shelf life of "dc link" capacitor.

Complete system rating, including all nameplate data, continuous operation load capability throughout speed range of 0 to 120 percent of rated speed.

Complete adjustable frequency controller rating coordinated with motor full load nameplate current rating; list any controller special features being supplied.

Controller, reactor, harmonic filter, and isolating transformer (if applicable) dimensional drawings; information on size and location of space for incoming and outgoing conduit.

Maximum heat dissipation from enclosure.

Should separate enclosures and equipment be necessary for filter elements or power factor correction equipment, provide complete dimensional information including location of space for incoming and outgoing conduit, weight, maximum heat loss, and minimum current carrying capacity and recommended wire size for required interconnecting circuits.

Layout of controller face showing pushbuttons, switches, instruments, indicating lights, etc.

Complete system operating description.

Complete system schematic (elementary) wiring diagrams.

Complete system interconnection diagrams between controller, drive motor, and all related components or controls external to system, including wire numbers and terminal board point identification.

One-line diagram of system, including component ratings.

Description of diagnostic features being provided.

Descriptive literature for all control devices such as relays, timers, etc.

Itemized bill-of-materials listing all system components.

Description of MPR being furnished or how these functions are accomplished within drive system.

1.4.2 Informational Submittals

Statement of Supplier qualifications.

Factory functional test reports.

Certified copy of test report for identical motor tested in accordance with NEMA MG 1-12.53a and IEEE Standard 112, Test Method B, showing rated load, rated speed efficiency meeting or exceeding specified values; motors not as specified will be rejected.

Special shipping, storage and protection, and handling instructions.

Manufacturer's printed installation instructions.

Field test reports.

Manufacturer's Certification of Proper Installation.

Suggested spare parts list to maintain equipment in service for a period of 1 year and 5 years. Include a list of special tools required for checking, testing, parts replacement, and maintenance with current price information.

List special tools, materials, and supplies furnished with equipment for use prior to and during startup and for future maintenance.

Operation and Maintenance Data: As specified in Section 01330, Administrative Requirements.

1.5 QUALITY ASSURANCE

Supplier: Minimum 5 years' experience in furnishing similar size and type adjustable frequency, controlled speed, drive systems.

1.6 EXTRA MATERIALS

Furnish for each size drive unit:

1. One complete drive.

2.0 PRODUCTS

2.1 MANUFACTURERS

Components and accessories specified in this section shall be products of:

1. Robicon.
2. Allen-Bradley.
3. Square D.
4. General Electric.

2.2 SERVICE CONDITIONS

Ambient Operating Temperature: 50 to 100 degrees F.

Storage Temperature: Minus 40 to 158 degrees F.

Humidity: 0 to 95 percent relative (noncondensing).

Altitude: 0 to 3,300 feet.

Frequency Stability: Plus or minus 0.1 percent of maximum frequency.

2.3 COMPONENTS

Drive Units:

1. Incorporate a switching power supply operating from a dc bus, to produce a PWM output waveform simulating a sine wave and providing power loss ride through of 2 milliseconds at full load, full speed.
2. Current-limiting semiconductor fuses for protection of internal power semiconductors.
3. Employ a diode bridge rectifier providing a constant displacement power factor of 0.95 minimum at all operating speeds and loads.
4. Use transistors for output section, providing a minimum 97 percent drive efficiency at full speed, full load.
5. Employ dc power discharge circuit so that after removal of input power dc link capacitor voltage level will decay below 50 volts dc within 1 minute after de-energizing following NEMA CP 1 and NFPA 79. Design dc link capacitor for a MTBF of 5 years.
6. Operate with an open circuited output.
7. Input Voltage: 480V ac plus or minus 10 percent.
8. Output Voltage: 0 to 480 volts, three-phase, 0 to 66-Hz, minimum.
9. Maximum peak voltage of PWM AFD output pulse of 1,000 volts, with pulse rise time of not less than 2 microseconds, and a maximum rate of rise of 500 volts per microsecond. Maximum frequency of PWM AFD output pulse (carrier) frequency of 3,000-Hz. Should magnitudes of these characteristics be more

- stressful to motor insulation than specified values, furnish insulation systems on the motors suitable for the proposed values.
10. Motor Audible Noise Level: When operating throughout speed range of PWM AFD, no more than 3 dBA above that designated in NEMA MG 1 for same motor operated at constant speed with a 60-Hz supply voltage.
 11. Short-Time Overload Capacity: 125 percent of rated load in rms current for 1 minute following full load, full speed operation.
 12. Equipment Short-Circuit Rating: Suitable for connection to system with maximum source three-phase, bolted fault, short-circuit available of 42,000 amps rms symmetrical at 480 volts.
 13. Furnish drives with output current-limiting reactors mounted within equipment enclosure.
 14. Diagnostics: Comprehensive for drive adjustment and troubleshooting:
 - a. Memory battery backup; 100-hour minimum during a power loss.
 - b. Status messages will not stop drive from running but will prevent it from starting.
 - c. Fault Condition Messages and History: First fault protection function to be activated, ability to store six successive fault occurrences in order. Minimum faults numerically:
 - 1) Overcurrent (time and instantaneous).
 - 2) Overvoltage.
 - 3) Undervoltage (dc and ac).
 - 4) Overtemperature (drive, motor windings, motor bearing, pump bearing).
 - 5) Serial communication fault.
 - 6) Short-circuit/ground fault (motor and drive).
 - 7) Motor stalled.
 - 8) Semiconductor fault.
 - 9) Microprocessor fault.
 - 10) Single-phase voltage condition.
 15. Drive Protection:
 - a. Fast-acting semiconductor fuses.
 - b. Overcurrent, instantaneous overcurrent trip.
 - c. Dc undervoltage protection, 70 percent dropout.
 - d. Dc overvoltage protection, 130 percent pickup.
 - e. Overtemperature, drive, inverter, converter, and dc link components.
 - f. Overtemperature, motor, and pump.
 - g. Single-phase protection.
 - h. Reset overcurrent protection (manual or automatic reset).
 - i. Active current limit/torque limit protection.
 - j. Semiconductor fault protection.
 - k. Short-circuit/ground fault protection.
 - l. Serial communication fault protection.
 - m. Microprocessor fault.

- n. Surge protection for transient overvoltage (6,000 volts, 80 joule surge, tested per IEEE C62.41).
 - o. Visual display of specific fault conditions.
16. Operational Features:
- a. Use manufacturer's standard unless otherwise indicated.
 - b. Sustained power loss.
 - c. Momentary power loss.
 - d. Power interruption.
 - e. Power loss ride through (0.1 second).
 - f. Start on the fly.
 - g. Electronic motor overload protection.
 - h. Stall protection.
 - i. Slip compensation.
 - j. Automatic restart after power return (ability to enable/disable function).
 - k. Critical frequency lockout (three selectable points minimum, by 1.5-Hz steps in 10-Hz bands, to prevent resonance of system).
 - l. Drive maintenance system software for complete programming and diagnostics.
 - m. Ground fault protection, drive, and motor.
 - n. Operate with no motor connected to output terminals.

Rectifier: Three-phase 6-pulse full wave diode bridge rectifier to provide a constant dc voltage to the drive's dc bus.

Furnish series choke and capacitors on dc bus to reduce ripple in rectifier output and to reduce harmonic distortion reflected into incoming power feeders.

Controller: Microprocessor-controller PWM inverter to convert to dc voltage to variable voltage, adjustable frequency three-phase ac output. The output voltage shall vary proportionally with the frequency to maintain a constant ratio of volts to hertz up to 60-Hz. Above 60-Hz, the voltage shall remain constant, with the drive operating in a constant horsepower output mode.

Enclosure:

1. NEMA 250, Type 1, gasketed, in MCC, mounting against wall, completely front accessible, and hinged doors. Properly sized to dissipate heat generated by controller within limits of specified operating conditions (including ambient temperature and ambient airflow). Enclosure not to exceed dimensions shown on Drawings.
2. Furnish drive complete with cable termination compartment door interlocked main circuit breaker, defeatable (lockable in the open position), emergency stop pushbutton, alphanumeric keypad and display, and operator's controls. Components and controls specified in Section 16010, Basic Electrical Requirements.

3. Wire drive from below and above for power and control wiring.
4. Size forced-ventilation for periodic operation to cool each unit with maximum room ambient temperature of 95 degrees F. Furnish redundant fans such that if one fan fails remaining fans furnish adequate ventilation for the drive when operating at maximum capacity. Furnish filters on ventilation intakes.
5. Bundle stranded copper wiring neatly with nylon tie wraps or with continuous plastic spiral binding; label each terminal for permanent identification of leads; identify each wire at each end with imprinted Mylar adhesive-back wire markers; incorporate in as-installed wiring diagrams for wire and terminal numbers shown; wiring across door hinges use 19-strand, NEMA WC-57 Class C stranding looped for proper twist rather than bending at hinge; wire connections internal to panels by crimp-on terminal types. For multiple enclosure systems, complete interconnection wiring with gasketed enclosure openings for wiring; multipoint plug receptacles for any control wiring crossing equipment shipping splits.
6. Selector switches, indicating lights, potentiometers, instruments, protective devices, major system components, etc., identified by means of mechanically attached, engraved, laminated nameplates.

Operator Interface:

1. Controls: Mount drive local control on front door of enclosure and include control switch and membrane type keypad for the following operator functions:
 - a. Start (when in local mode).
 - b. Stop (when in local mode).
 - c. Speed increase (when in local mode).
 - d. Speed decrease (when in local mode).
 - e. Parameter mode selection (recall programmed parameters).
 - f. LOCAL/OFF/REMOTE control selection (in remote, furnish for remote RUN command digital input and speed increase/decrease via remote 4 to 20 mA analog signal).
 - g. Fault reset, manual for all faults (except loss of ac voltage which is automatic upon return).
 - h. RUN/preset speed.
 - i. Parameter lock (password or key switch lockout of changes to parameters).
 - j. Start disable (key switch or programmed code).
2. Control circuit disconnect shall de-energize circuits in units that are not de-energized by main power disconnect device.
3. 120 volts, single-phase, 60-Hz circuits for control power and operator controls from internal control power transformer. Furnish power for motor space heaters rated 120 volts.
4. Arrange component and circuit such that failure of any single component cannot cause cascading failure(s) of any other component(s).

5. Alphanumeric Display: During normal operation and routine test, the following parameters shall be available:
 - a. Motor current (percent of drive rated current).
 - b. Output frequency (Hertz).
 - c. Output voltage.
 - d. Running time.
 - e. Local/remote indicator.
 - f. Status of digital inputs and outputs.
 - g. Analog input and output values.
 - h. Output motor current per leg.
 - i. All test points.
6. Adjustable Parameters: Set drive operating parameters and indicate in a numeric form. Potentiometers may not be used for parameter adjustment. Minimum setup parameters available:
 - a. Frequency range, minimum, maximum.
 - b. Adjustable acceleration/deceleration rate.
 - c. Volts per Hertz (field weakening point).
 - d. Active current limit/torque limit, 0 to 140 percent of drive rating.
 - e. Adjustable voltage boost (IR compensation).
 - f. Preset speed (adjustable, preset operating point).
 - g. Provision for adjustment of minimum and maximum pump speed to be furnished as function of 4 to 20 mA remote speed signal.

Signal Interface:

1. Digital Input:
 - a. Accept a remote RUN command contact closure input.
 - b. High temperature contact closure input from field mounted motor temperature monitoring relay.
2. Digital Output: Furnish three discrete output dry contact closures rated 5 amps at 120 volts ac.
 - a. DRIVE RUNNING.
 - b. DRIVE FAULT (with common contact closure for all fault conditions).
 - c. DRIVE IN REMOTE MODE.
3. Analog Input: When LOCAL/OFF/REMOTE switch is in REMOTE, control drive speed from a remote 4 to 20 mA dc signal. Make provisions for adjustment of minimum and maximum motor speed which shall result from this signal. Factory set this adjustment to comply with operating speed range designated in driven equipment specifications. Frequency resolution shall be 0.1 percent of base speed.
4. Analog Output: Furnish one 4 to 20 mA dc signal, for actual speed.

Accessories:

1. Equipment Identification Plate: 16-gauge stainless steel with 1/4-inch die-stamped equipment tag number securely mounted in a readily visible location.
2. Lifting Lugs: Equipment weighing over 100 pounds.
3. Anchor Bolts: Galvanized, sized by equipment manufacturer, 1/2-inch minimum diameter, and as specified in Section 05500, Metal Fabrications and Castings.
4. Motor Protection Relay (MPR): For each drive include a MPR as specified in Section 16220, Low-Voltage AC Induction Motors, or furnish functions within drive system. Communications protocol and signal compatibility shall be as required for MPRs.

2.4 FACTORY FINISHING

2.4.1 Enclosure

Primer: One coat of rust-inhibiting coating.

Finish:

1. Interior: One coat white enamel.
2. Exterior: One coat manufacturer's standard gray enamel or TIA/EIA 359-1, No. 61.

Manufacturer's standard baked enamel finish.

2.5 SOURCE QUALITY CONTROL

Factory Inspections: Inspect control panels for required construction, electrical connection, and intended function.

Factory Tests and Adjustments: Test one control panels identical to that furnished.

Record test data for report.

Functional Test: Perform manufacturer's standard.

Motor Test: See Section 16220, Low-Voltage AC Induction Motors.

3.0 EXECUTION

3.1 INSTALLATION

Install in accordance with manufacturer's printed instructions.

3.2 FIELD QUALITY CONTROL

3.2.1 Functional Test

Conduct on each controller.

Inspect controller for electrical supply termination connections, interconnections, proper installation, and quiet operation.

Vibration Test: Complete assembly, consisting of motor, load, and flexible shafting, connected and in normal operation, shall not develop amplitudes of vibration exceeding limits recommended by current edition of Hydraulic Institute Standards. Where loads and drives are separated by intermediate flexible shafting, measure vibration both at top motor bearing and at two points on top pump bearing, 90 degrees apart.

Record test data for report.

3.2.2 Performance Test

Conduct on each controller.

Perform under actual or approved simulated operating conditions.

Test for continuous 12-hour period without malfunction.

Demonstrate performance by operating the continuous period while varying the application load, as the input conditions allow, to verify system performance.

Record test data for report.

With pump station load connected to normal utility source, measure the following to show parameters within specified limits:

1. Total and individual current harmonic distortion (up to and including 35th harmonic) at location identified as input to main located in MCC in Simplified Pump Station One-Line Diagram, under following load conditions:
 - a. AFDs running at full load and half load.
 - b. Half of the specified AFDs running at full load and half load.
2. Power factor at input side of each drive. Documented verification that power factor is maintained at 95 percent as speed of drive goes down from 100 percent to 33 percent.

3.2.3 Test Equipment

Use Dranetz, Model No. 626-PA, harmonic distortion monitor and Series 626 disturbance analyzer or equivalent instrument to document results.

Provide diagnostic plug-in test card complete with instructions, multiposition selector switch, and meters or built-in diagnostic control panel or ROM-based processor for monitoring ac, dc, and digital signals to assist in troubleshooting and startup of drive.

3.3 MANUFACTURERS' SERVICES

Manufacturer's Representative: Present at Site or classroom designated by Owner, for minimum person-days listed below, travel time excluded:

1. 1 person-day for installation assistance and inspection.
2. 1 person-day for functional and performance testing and completion of Manufacturer's Certificate of Proper Installation.
3. 0.5 person-day for prestartup classroom or Site training.
4. 0.5 person-day for facility startup.
5. 0.5 person-day for post-startup training of Owner's personnel. Training shall not commence until an accepted detailed lesson plan for each training activity has been reviewed by Owner.

See Section 01460, Inspections and Tests, and Section 01661, Operational Acceptance Testing.

END OF SECTION 16260

SECTION 16270

OIL-FILLED PAD MOUNTED TRANSFORMERS

TABLE OF CONTENTS

1.0	GENERAL	2
1.1	REFERENCES	2
1.2	SUBMITTALS	2
1.3	QUALITY ASSURANCE.....	3
1.4	EXTRA MATERIALS	3
2.0	PRODUCTS.....	3
2.1	MANUFACTURERS	3
2.2	GENERAL	3
2.3	TRANSFORMER.....	4
2.4	ENCLOSURE	4
2.5	TERMINAL COMPARTMENTS	5
2.6	BUSHINGS	6
2.7	HIGH VOLTAGE SWITCHING.....	6
2.8	HIGH VOLTAGE PROTECTION	7
2.9	LOW VOLTAGE PROTECTION	7
2.10	SURGE ARRESTORS	7
2.11	TANK GROUNDING PADS	7
2.12	TAP CHANGER WARNING SIGN	7
2.13	FACTORY TESTS	8
3.0	EXECUTION	8
3.1	GENERAL	8
3.2	ADJUSTMENTS	8

SECTION 16270

OIL-FILLED PAD MOUNTED TRANSFORMERS

1.0 GENERAL

1.1 REFERENCES

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

1. ASTM International (ASTM): D3487, Standard Specification for Mineral Insulating Oil Used in Electrical Apparatus.
2. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
 - a. 386, Standard for Separable Insulated Connector Systems for Power Distribution Systems Above 600V.
 - b. C57.12.00, Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers.
 - c. C57.12.22, Pad-Mounted, Compartmental-Type, Self-Cooled, Three-Phase Distribution Transformers with High-Voltage Bushings, 2,500 kVA and Smaller.
 - d. C57.12.26, Pad-Mounted, Compartmental-Type, Self-Cooled, Three-Phase Distribution Transformers for Use with Separable Insulated High Voltage Connectors.
 - e. C57.12.28, Switchgear and Transformers—Pad-Mounted Equipment, Enclosure Integrity.
 - f. C57.12.90, Standard Test Code for Liquid Immersed Distribution, Power, and Regulating Transformers.
 - g. C57.106, Guide for Acceptance and Maintenance of Insulating Oil in Equipment.
 - h. C62.11, Metal-Oxide Surge Arrestors for Alternating-Current Power Circuits (>1 kV).
3. National Electrical Manufacturers Association (NEMA):
 - a. TR 1, Transformers, Regulators, Reactors.
 - b. TP 1, Guide for Determining Energy Efficiency for Distribution Transformers.
4. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).
5. Underwriters Laboratories Inc. (UL).

1.2 SUBMITTALS

1.2.1 Action Submittals

Descriptive information.

Dimensional drawings.

Transformer nameplate data.

Schematic and connection diagrams.

1.2.2 Informational Submittals

Operation and Maintenance Data: As specified in Section 01300, Administrative Requirements.

Factory test reports .

1.3 QUALITY ASSURANCE

Design, test, and assemble in accordance with applicable standards of NEMA TR 1, IEEE C57.12.00, IEEE C57.12.22, IEEE C57.12.26, and IEEE C57.12.90.

1.4 EXTRA MATERIALS

Furnish, tag, and box for shipment and storage and deliver prior to 90 percent Project completion the following spare parts and materials:

1. One quart of paint to match color and quality of equipment final shop finish.
2. One spare fuse link for each replaceable fuse size.

2.0 PRODUCTS

2.1 MANUFACTURERS

Cutler-Hammer.

Square D Co.

General Electric.

Cooper Power System.

2.2 GENERAL

2.2.1 Integral Unit

Compartmental type unit consisting of transformer, oil-filled tank, and high and low voltage terminating compartments, assembled on a common structural base.

2.2.2 Anchor Bolts

Hot dipped galvanized steel, sized by equipment manufacturer, 1/2-inch minimum diameter, and as specified in Section 05500, Metal Fabrications and Castings.

2.3 TRANSFORMER

kVA Rating: 1000.

Primary FLA: 46

Secondary FLA: 1204

Primary Voltage: 12.47/7.2 kV line-to-line, volts, three-phase, four-wire, 60-Hz.

Secondary Voltage: 480/277 volts, three-phase, four-wire, 60-Hz.

BIL Rating:

1. 95 BIL for 15 kV insulation class transformers.
2. 30 BIL for secondary.

Temperature Rise: 65 degrees C above 30 degrees average ambient with maximum ambient not to exceed 45 degrees C.

Impedance: 5.75 percent for transformers rated 750 kVA and above.

Efficiency: Meet or exceed values in Table 4-1 of NEMA TP 1.

Dielectric Coolant: Fully biodegradable, nontoxic, and nonbioaccumulating fluid, qualifying as "less flammable" per NEC 450.23; Factory Mutual Approved or UL Classified.

Primary Taps:

1. Full capacity, two 2-1/2 percent below and two 2-1/2 percent above, rated voltage.
2. Externally operated no-load tap changer.
3. Provisions for locking handle in any position.

Coil Conductors: Copper windings.

Wye-wye transformers wound on five-legged or triplex cores.

Sound Level: In accordance with manufacturer's standards.

2.4 ENCLOSURE

In accordance with IEEE C57.12.28 requirements.

Welded carbon steel transformer tank, with cooling panels when required, and lifting eyes.

12-gauge sheet steel terminal compartment enclosure having no exposed screws, bolts, or other fasteners that are externally removable.

Color: Provide manufacturer's standard gray finish as approved by Owner.

2.5 TERMINAL COMPARTMENTS

2.5.1 General

IEEE C57.12.28, enclosed high and low voltage compartments side by side, separated by steel barrier, bolted to transformer tank.

1. Doors:

- a. Individual, full-height, air-filled.
- b. Low voltage door with three-point latching mechanism, vault type handle, and single padlocking provision.
- c. High voltage door fastenings inaccessible until low voltage door has been opened.
- d. Door Bolts: Hex-head type.
- e. Lift-off, stainless steel hinges and door stops.
- f. Removable front sill to facilitate rolling or skidding over conduit stubs.
- g. Recessed lock pocket, with steel door release bolt adjacent to secondary compartment door handle.

2.5.2 High Voltage Compartment

Deadfront in accordance with IEEE C57.12.26 type construction.

Protective fuses.

High voltage bushings.

Transformer grounding pad.

Surge arrestors with barriers.

Radial feed, two position sectionalizing load-break switch.

2.5.3 Low Voltage Compartment

Livefront in accordance with IEEE C57.12.26 type construction.

Low voltage bushings. Bushings shall be able to accept four lugs/phase of No. 350 AWG.

Grounding pad.

Stainless steel equipment nameplate.

Liquid level gauge.

1-inch upper filter press and filling plug.

Drain valve with sampling device.

Dial type thermometer.

Pressure relief valve.

Pressure relief device, self-resealing with indicator.

Pressure-vacuum gauge.

Nameplate.

2.6 BUSHINGS

2.6.1 High Voltage

Deadfront Termination:

1. Universal bushing well rated at 15 kV in accordance with IEEE 386.
2. Bushings externally clamped and front removable.
3. Rated for 200 amperes continuous, 95 kV BIL.
4. Standoff brackets located adjacent to bushings.

2.6.2 Low Voltage

Molded epoxy bushing clamped to tank with eight-hole spade type terminals.

Rated 150 percent of continuous full-load current, 30 BIL, 600 volts.

Internally connected neutral extending to neutral bushing.

2.7 HIGH VOLTAGE SWITCHING

Internal, oil-immersed, gang-operated load-break, manually operated switches.

Hot stick operated handle located in high voltage compartment.

Capable of operating at full-load current.

Feed Switch: Two-position, ON/OFF radial.

2.8 HIGH VOLTAGE PROTECTION

2.8.1 Combination Oil-Immersed Bayonet Expulsion and Current Limiting Fuses

Accessibility:

1. Bayonet expulsion fuse accessible through primary compartment.
2. Current-limiting fuse accessible through tank handhole.

Expulsion Fuse for Low Current Faults: Interrupting capacity of 1,800 amperes rms asymmetrical.

Current Limiting for High Current Faults: Interrupting capacity of 50,000 amperes rms symmetrical.

Bayonet fuse externally replaceable with hot stick.

2.9 LOW VOLTAGE PROTECTION

Provide lugs for four parallel #350 AWG copper cables.

Transformer will have lugs as shown on Electrical one-line drawings. The feeder cable from the transformer secondary to the MCC main shall be less than 25 feet.

2.10 SURGE ARRESTORS

Elbow Valve Type: Uninsulated body, 9 kV with barriers in accordance with IEEE C62.11.

2.11 TANK GROUNDING PADS

2.11.1 High and Low Voltage Compartments

Connected together with bare No. 2/0 stranded copper conductors.

Wye-wye high and low voltage neutrals internally connected with link and brought out to insulated low voltage bushing externally grounded to tank.

Low voltage neutral connected to externally mounted insulating bushing in low voltage compartment and grounded to tank with removable strap.

2.12 TAP CHANGER WARNING SIGN

Red laminated plastic, engraved to white core.

Engrave to read: DO NOT OPERATE WHEN TRANSFORMER ENERGIZED.

Mount above tap changer handle.

2.13 FACTORY TESTS

Production tests in accordance with IEEE C57.12.90 and IEEE C57.12.00, Section 8 and Table 16.

Dielectric test in accordance with IEEE C57.12.26.

3.0 EXECUTION

3.1 GENERAL

Secure to mounting pads with anchor bolts.

Install plumb and longitudinally in alignment with pad or adjacent building wall.

Ground neutrals and enclosures in accordance with applicable codes.

3.2 ADJUSTMENTS

Adjust voltage taps to obtain rated output voltage under normal operating load conditions.

END OF SECTION 16270

SECTION 16288

TRANSIENT VOLTAGE SUPPRESSION

TABLE OF CONTENTS

1.0	GENERAL	2
1.1	SUBMITTALS	2
1.2	QUALITY ASSURANCE	2
2.0	PRODUCTS	2
2.1	GENERAL	2
2.2	MANUFACTURER	3
2.3	MAIN DISTRIBUTION TVSS	3
2.4	PANELBOARD TVSS	3
2.5	ANNUNCIATION	4
2.6	SURGE COUNTER	4
2.7	PAIRED CABLE DATA LINE INTERIOR SUPPRESSORS	4
2.8	PAIRED CABLE DATA LINE EXTERIOR SUPPRESSORS	4
3.0	EXECUTION	5
3.1	APPLICATION REQUIREMENTS	5
3.2	GENERAL INSTALLATION REQUIREMENTS	5

SECTION 16288

TRANSIENT VOLTAGE SUPPRESSION

1.0 GENERAL

1.1 SUBMITTALS

Submit product data on each suppressor type, indicating component values, part numbers, and conductor sizes. Include dimensional drawing for each, showing mounting arrangements.

Submit manufacturer's UL certified test data and nameplate data for each TVSS.

Submit electrical single-line diagram showing location of each TVSS.

1.2 QUALITY ASSURANCE

1.2.1 UL Compliance and Labeling

For power and signal circuits, TVSS devices shall comply with UL 1449 and complimentary listed to UL 1283 as an electromagnetic interference filter. Provide units that are listed and labeled by UL.

For telephone circuit protection, TVSS devices shall comply with UL 497A.

1.2.2 ANSI Compliance

Use TVSS devices in compliance with the recommendations of IEEE C62.41.1, IEEE C62.41.2, and IEEE C62.45.

2.0 PRODUCTS

2.1 GENERAL

All TVSS devices for power circuits, provided under this section, shall be the product of a single manufacturer.

TVSS devices shall be capable of performance at ambient temperatures between minus 0 degrees C and 50 degrees C, at relative humidity ranging from 0 percent to 95 percent, and at altitudes ranging from sea level to 12,000 feet.

TVSS devices shall be fused to disconnect the suppressor from the electrical source should the suppressor fail. The fusing shall allow full surge handling capabilities and to afford safety protection from thermal overloads and short circuits.

Design TVSS devices for the specific type and voltage of the electrical service. Single-phase and three-phase wye-configured systems shall have L-N, L-G, and N-G protection. Grounded delta-configured systems shall have L-L and L-G protection.

Power Filter: The TVSS shall include a high frequency extended range power filter complimentary listed to UL 1283 as an electromagnetic interference filter.

2.2 MANUFACTURER

Innovative Technology, VanGuard Series.

Advanced Protection Technologies, Inc.

General Electric.

2.3 MAIN DISTRIBUTION TVSS

Provide TVSS meeting IEEE C62.41.1 and IEEE C62.41.2 Location in accordance with Category C.

Surge current capacity shall be not less than the following:

1. L-N Capacity: 200 kA.
2. L-G Capacity: 120 kA.
3. N-G Capacity: 120 kA.

Suppressor housing shall be in an enclosure that has the same NEMA rating as the equipment it protects and painted to match.

UL 1449 maximum suppression voltage shall not be more than:

System Voltage	Phase	L-L or L-N Suppression Voltage
120	1	400
208Y/120	3	400
240	3	800
480Y/277	3	800

2.4 PANELBOARD TVSS

Provide TVSS meeting IEEE C62.41.1 and IEEE C62.41.2 Location Category B.

Surge current capacity shall be not less than the following:

1. L-L Capacity: 80 kA.
2. L-N Capacity: 80 kA.

3. L-G Capacity: 80 kA.
4. N-G Capacity: 80 kA.

Suppressor shall be in an enclosure that has the same NEMA rating as the panel it protects or the TVSS may be integral to a panelboard.

UL 1449 maximum clamp voltage shall not be more than:

System Voltage	Phase	L-L or L-N Clamp Voltage
120	1	400
208Y/120	3	400
240	3	800
480Y/277	3	800

2.5 ANNUNCIATION

Provide unit or separately mounted LED-type indication lights to show the normal and failed status of each module. Provide one normally open and one normally closed contacts which operate when the unit fails.

2.6 SURGE COUNTER

Provide each TVSS rated above 100 kA with a counter displaying the number of voltage transients that have occurred on the unit input. The counter shall be battery backed and retain the count through system power outages.

2.7 PAIRED CABLE DATA LINE INTERIOR SUPPRESSORS

Provide units meeting IEEE C62.41, Location Category A.

Use bi-polar 1,500-watt silicon avalanche diodes between the protected conductor and earth ground.

Provide units with a maximum single impulse current rating of 80 amperes (10 by 1,000 microsecond-waveform).

Breakdown voltage shall not exceed 36 volts.

2.8 PAIRED CABLE DATA LINE EXTERIOR SUPPRESSORS

Provide units meeting IEEE C62.41, Location Category A.

Suppressors shall be a hybrid design with a minimum of three stages, utilizing solid-state components and operating bi-directionally.

Suppressors shall meet or exceed the following criteria:

1. Maximum single impulse current rating of 10,000 amperes (8 by 20 microsecond-waveform).
2. Pulse Life Rating: 3,000 amperes (8 by 20 microsecond-waveform): 2,000 occurrences.
3. Maximum clamping voltage at 10,000 amperes (8 by 20 microsecond current waveform), shall not exceed the peak of the normal applied signal voltage by 200 percent.

3.0 EXECUTION

3.1 APPLICATION REQUIREMENTS

Install TVSS when indicated on the Drawings and:

1. Main Distribution TVSS in or near each low-voltage switchgear (load center).
2. Main Distribution TVSS in or near each motor control center.
3. Panelboard TVSS In or near each distribution panelboard unless otherwise indicated.

Electronic Equipment Paired Cable Conductors: Install data line suppressors at the low voltage input and output of each piece of equipment, including telephone cable entrance.

1. Use secondary protectors on lines that do not exit the structure.
2. Use primary protectors on lines that exit and enter the structure.

3.2 GENERAL INSTALLATION REQUIREMENTS

Install suppressors according to manufacturer's recommendations.

Install suppressors directly to the cabinet which houses the circuit to be protected so that the suppressor leads are straight and short, with all conductors laced, running directly to the point of connection within the panel, without loops or bends. If bends are unavoidable, no bend may exceed 90 degrees and bending radius may not be less than 6 inches.

Connecting wires shall be as short as possible with gently twisted conductors, tied together, to prevent separation. Connecting wires shall not exceed 24 inches in length at any point.

Field installed conductors shall be the same as specified for building wire, not smaller than No. 8 AWG and not larger than No. 4 AWG. Device leads shall not be longer than the length recommended by the manufacturer, unless specifically reviewed and approved by the manufacturer.

Provide dedicated disconnecting means for TVSS devices installed at main service entrance location, switchgear, and motor control centers. Provide dedicated 30-60-ampere circuit breakers (size dependent upon wire size used) with number of poles as required, as disconnecting means for TVSS devices installed at panelboards. The interrupting capacity of the circuit breakers shall be that specified for the other breakers at that location.

END OF SECTION 16288

SECTION 16412

AUTOMATIC TRANSFER SWITCHES

TABLE OF CONTENTS

1.0	GENERAL	2
1.1	REFERENCES	2
1.2	SUBMITTALS	2
1.3	QUALITY ASSURANCE.....	3
2.0	PRODUCTS.....	3
2.1	MANUFACTURERS	3
2.2	GENERAL	3
2.3	ENCLOSURE	4
2.4	TRANSFER SWITCH	4
2.5	CONTROL MODULE	4
2.6	SIGNAL INTERFACE	5
2.7	INDICATORS.....	5
2.8	FACTORY TESTS.....	6
3.0	EXECUTION	6
3.1	INSTALLATION	6

SECTION 16412

AUTOMATIC TRANSFER SWITCHES

1.0 GENERAL

1.1 REFERENCES

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

1. Institute of Electrical and Electronics Engineers (IEEE): C37.90.1, Standard for Surge Withstand Capability (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus.
2. National Electrical Manufacturers Association (NEMA):
 - a. ICS 1, General Standards for Industrial Control and Systems: General Requirements.
 - b. ICS 2, Industrial Control and Systems Controllers, Contactors, and Overload Relays not more than 2000 volts ac or 750 volts ac.
 - c. ICS 6, Industrial Control And Systems: Enclosures 250, Enclosures for Electrical Equipment (1,000 Volts Maximum).
3. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).
4. Underwriters Laboratories, Inc. (UL): 1008, Transfer Switch Equipment.

1.2 SUBMITTALS

1.2.1 Action Submittals

Descriptive product information.

Dimensional drawings.

Control diagrams.

Conduit entrance locations.

Equipment ratings.

1.2.2 Informational Submittals

Factory test reports.

Operation and Maintenance Data: As specified in Section 01330, Instructions and Manuals.

Manufacturer's Certificate of Compliance, in accordance with Section 01450, Contractor Quality Control.

1.3 QUALITY ASSURANCE

1.3.1 Authority Having Jurisdiction (AHJ)

Provide the Work in accordance with NFPA 70, National Electrical Code (NEC). Where required by the AHJ, material and equipment shall be labeled or listed by a nationally recognized testing laboratory or other organization acceptable to the AHJ in order to provide a basis for approval under NEC.

Materials and equipment manufactured within the scope of standards published by Underwriters Laboratories, Inc. shall conform to those standards and shall have an applied UL listing mark.

2.0 PRODUCTS

2.1 MANUFACTURERS

ASCO.

Or approved equal.

2.2 GENERAL

Transfer switch to be product of a single manufacturer in order to achieve standardization for appearance, operation, maintenance, spare parts, and manufacturer's service.

In accordance with applicable standards of NFPA 70, NEMA ICS 1, NEMA ICS 2, NEMA ICS 6, IEEE C37.90.1, and UL 1008.

Transfer switch consisting of inherently double-throw power switch unit with interconnected control module.

Rated 100 percent, in amperes, for total system transfer of motor, electric heating, discharge lamp loads, and tungsten-filament lamp loads.

1. Switches rated above 400 amperes suitable for 30 percent tungsten-filament lamp loads.

Main and arcing contacts visible for inspection with cabinet door and barrier covers removed.

Neutral transfer contacts for switched neutral conductors.

Suitable for 480/277 volts, three-phase, three-wire, grounded-wye electrical service having an available short circuit current at line terminals of 65,000 amperes rms symmetrical.

Switch Rating: 1,600 continuous amperes in nonventilated enclosure.

Current carrying capacity of arcing contacts shall not be used to determine the transfer switch rating.

Suitable for use with 75 degrees C wire at full NFPA 70, 75 degrees C ampacity.

Operating Conditions:

1. Ambient Temperature: Maximum 40 degrees C.
2. Equipment to be fully rated without any derating for operating conditions listed above.

2.3 ENCLOSURE

Type: Open for mounting in motor control center.

2.4 TRANSFER SWITCH

Type: Electrically operated, mechanically held, double-throw.

Momentarily energized, single-electrically operated mechanism energized from source to which load is to be transferred.

Locking mechanism to maintain constant contact pressure.

Time delay in neutral position or programmed transition.

Silver alloy contacts protected by arcing contacts.

Main and arcing contacts visible when door is open and barrier covers removed.

Manual operating handle for transfer in either direction under either loaded or unloaded conditions.

Internal control wire connections made with ring or spade type terminals, lock washers, and sleeve type marking labels.

2.5 CONTROL MODULE

Completely enclosed and mounted separately from the transfer switch unit.

Microprocessor for sensing and logic control with inherent digital communications capability.

Plug-in, industrial grade interfacing relays with dust covers.

Connected to transfer switch by wiring harness having keyed disconnect plug.

Plug-in printed circuit boards for sensing and control logic.

Adjustable solid state undervoltage sensors for all three phases of normal and for one phase of standby source:

1. Pickup 85 to 100 percent nominal.
2. Dropout 75 to 98 percent of pickup setting.

Adjustable frequency sensors for standby source:

1. Pickup 90 to 100 percent nominal.
2. Dropout 87 to 89 percent of pickup setting.

Control module with adjustable time delays:

1. 0- to 5-minute load transfer to emergency delay.
2. 0- to 30-minute retransfer to normal delay.
3. Switch to bypass any of the above time delays during testing.

Form-C start contacts, rated 10 amperes, 32-volt dc, for two-wire engine control, wired to terminal block.

In-phase monitor to control transfer when both sources are within acceptable phase angle limits, or adjustable pneumatic type time delay relay for time-delay-in neutral position.

2.6 SIGNAL INTERFACE

Digital Output: Furnish four discrete output dry contact closures rated 5 amps at 120 volts ac.

1. POWER FAIL.
2. PRIMARY POSITION.
3. BACKUP POSITION.
4. RE-TRANSFER.

2.7 INDICATORS

Type: Manufacturer's standard.

Green lens to indicate switch position for normal power source.

Red lens to indicate switch position for standby power source.

Green lens to indicate normal power source is available within parameters established by pickup and dropout settings. Red lens to indicate standby power source is available within parameters established by pickup and dropout settings.

Three amber lenses to indicate isolation handle position.

One flashing amber lens to indicate not in automatic mode.

2.8 FACTORY TESTS

Test to Ensure Correct:

1. Operation of individual components.
2. Sequence of operation.
3. Transfer time, voltage, frequency, and time delay settings.

Dielectric strength test per NEMA ICS 1.

3.0 EXECUTION

3.1 INSTALLATION

Install in accordance with manufacturer's instructions.

Secure enclosure to floor using anchor bolts

END OF SECTION 16412

SECTION 16480

MOTOR CONTROL CENTERS

TABLE OF CONTENTS

1.0	GENERAL	2
1.1	SECTION INCLUDES	2
1.2	DESIGN AND PERFORMANCE REQUIREMENTS	2
1.3	SUBMITTALS	2
1.4	QUALIFICATIONS	3
1.5	DELIVERY, STORAGE, AND HANDLING	4
1.6	FIELD MEASUREMENTS	4
1.7	INSTALLATION ASSISTANCE	4
2.0	PRODUCTS	4
2.1	GENERAL	4
2.2	COMPLETE ASSEMBLY	4
2.3	CONSTRUCTION	5
2.4	BUSES	5
2.5	WIRING AND TERMINATION	6
2.6	MOTOR CONTROLLERS	6
2.7	METERING AND PROTECTION UNIT (MPU)	7
2.8	COMMUNICATIONS CAPABILITY	8
2.9	POWER FACTOR CORRECTION (ACTIVE FILTER)	8
2.10	INCOMING FEEDER TERMINATION	11
2.11	MAIN BREAKERS	11
2.12	FEEDER BREAKERS	11
2.13	PANELBOARDS	12
2.14	DRY-TYPE TRANSFORMERS	12
2.15	ENCLOSURES	13
2.16	FINISH	13
2.17	SPARE PARTS AND SPECIAL TOOLS	13
3.0	EXECUTION	13
3.1	INSTALLATION AND TESTING	13
3.2	INSTALLATION SUPERVISION	13
3.3	FIELD TESTING	14
3.4	MANUFACTURER'S CERTIFICATION	14
3.5	TRAINING	14

SECTION 16480

MOTOR CONTROL CENTERS

1.0 GENERAL

1.1 SECTION INCLUDES

Design and performance requirements.

Submittals.

Qualifications.

Field measurements.

1.2 DESIGN AND PERFORMANCE REQUIREMENTS

Conform to requirements of NEC, NEMA, ANSI, and UL 845.

Contract Drawings are provided to show general guidelines and suggested layouts for motor control centers (MCCs). Contractor is fully responsible for detailed engineering and design in accordance with referenced standards and with the operations and reliability requirements specified herein.

Equipment start and stop shall be enabled both locally at the MCC and from external control systems specified elsewhere in these Specifications. Provide equipment, and interface to meet these control and communications requirements whether or not specifically called out in this section.

Power factor for dewatering pump motors shall be 95 percent minimum. Provide power factor correction capacitors needed to meet this requirement based on motors supplied under Section 16220, Low-Voltage AC Induction Motors.

Coordinate with the manufacturer of pre-engineered building such that equipment is assembled, tested and installed into the pre-engineered buildings prior to delivery to the jobsite.

1.3 SUBMITTALS

Submit in accordance with Section 01300, Administrative Requirements.

Submit the following design data:

1. MCC one-line diagrams.
2. Front view and plan view of the assembly.
3. Three-line diagrams.

4. Schematic diagrams.
5. Nameplate schedule.
6. Component list.
7. Conduit entry details.
8. Assembly ratings, including:
 - a. Short-circuit rating.
 - b. Voltage.
 - c. Continuous current rating.
9. Major component ratings, including:
 - a. Voltage.
 - b. Continuous current rating.
 - c. Interrupting ratings.
10. Cable terminal size.
11. Product data sheets.
12. Seismic anchorage and bracing design in accordance with Section 01611.
13. Active Filter:
 - a. System configuration in a single line diagram.
 - b. Size and weights of shipping units to be handled by installer.
 - c. Dimensional drawings with installed weight and heat dissipation for each size provided.
 - d. Detailed layouts of customer power and control connections.
 - e. Detailed installation drawings including all terminal locations.
 - f. Technical brochure detailing the standard features of the power correction system.

Submit the following record data:

1. Final as-built drawings.
2. Wiring diagrams.
3. Certified product test reports.
4. Seismic certification.
5. Installation information.

1.4 QUALIFICATIONS

Materials, equipment, and accessories specified in this section shall be products of:

1. Eaton Electrical/Cutler-Hammer.
2. GE Industrial Systems.
3. Schneider Electric/Square D Services.
4. Allen-Bradley.
5. Siemens.

For equipment specified herein the manufacturer shall be ISO9000 certified.

Equipment and major components shall be suitable for and certified to meet all applicable environmental requirements specified in Section 16010, Basic Electrical Requirements.

Active Filter: Prior to shipment, the manufacturer shall fully test the performance at full current and voltage while functioning as a harmonic correction device to assure compliance with equipment Specifications defined herein. A certified report shall be provided to the District of successful completion of performance tests.

1.5 DELIVERY, STORAGE, AND HANDLING

Equipment shall be factory assembled and tested, and delivered and stored in accordance with manufacturer's instructions.

Equipment shall be shipped in fully assembled MCC line-ups, installed in the pre-engineered buildings.

1.6 FIELD MEASUREMENTS

Coordinate with District and pre-engineered building supplier to verify proposed equipment will fit into designated spaces and will not interfere or conflict with access, structural building elements, doors and windows, and other structures on site.

Submit final product dimensions and mounting details as part of the second shop drawing submittal.

1.7 INSTALLATION ASSISTANCE

As specified in Part 3, Execution.

2.0 PRODUCTS

2.1 GENERAL

2.1.1 Rating

600-volt class suitable for operation on 480-volt, three-phase, four-wire, 60-Hz system.

2.2 COMPLETE ASSEMBLY

Consist of enclosed vertical sections joined together to form a rigid, self-standing assembly, and mounted in pre-engineered MCC building specified in Section 13121, Prefabricated Buildings. Completely assembled and wired at the factory prior to delivery, requiring only cable connections in the field.

2.3 CONSTRUCTION

2.3.1 Structure

Totally enclosed, dead-front, free-standing enclosures. Maximum dimensions shall not exceed 90 inches high and 21 inches deep, with 30 inches wide for individual vertical section for front-mounted units. Vertical sections shall support horizontal and vertical buses, combination starter units, covers, and door, and shall be designed for easy rearrangement of units.

2.3.2 Horizontal Wireways

Locate at top and bottom, isolated from horizontal buses and accessible through hinged or screwed cover. Provide adequate space for conduit and wiring to enter the space.

2.3.3 Vertical Wireways

Locate on right-hand side of each vertical section and extend from top horizontal wireway to bottom of the available unit mounting space. Each vertical wire trough shall be isolated from bus bar to guard against accidental contact. A separate hinged door shall be provided for vertical wireways.

2.3.4 Draw-out Type Starters

All starters shall be of draw-out type, including guide rail system and stab shrouds. Draw-out units shall have tin-plated plug-in stab assembly for connection to vertical bus.

2.3.5 Door Interlock

Each draw-out unit shall include mechanical door interlock to prevent access to internal components unless the primary disconnect is in the OFF position. A defeater shall be provided to bypass the interlock. Padlocking facilities shall be provided to positively lock the primary disconnect in the OFF position.

2.3.6 Nameplates

As shown on Contract Drawings.

2.4 BUSES

2.4.1 Rating

1,200 amp continuous, minimum, for horizontal, 300 amp continuous for vertical buses, minimum, 50 degrees C rise over 40 degrees C ambient.

2.4.2 Material

Copper, tin-plated.

2.4.3 Bus Bracing

65,000 amp RMS symmetrical.

2.4.4 Ground Bus and Lug

Horizontal copper ground bus shall run continuously throughout the MCC at the bottom. Ground lug capable of accepting #8-250 kc mil shall be provided for incoming vertical section.

2.4.5 Insulation Barriers

Insulated horizontal and vertical bus barriers shall be furnished to reduce hazard of accidental contact with buses.

2.5 WIRING AND TERMINATION

NEMA Class II, Type B termination.

2.6 MOTOR CONTROLLERS

Combination Starter Units: Full voltage non-reversing type, size as shown on Contract Drawings, or as required, and rated 65,000 AIC. Combination starters shall utilize motor circuit protectors (MCP), providing adjustable magnetic protection up to 1,300 percent motor nameplate full load current. MCPs shall include transient override feature for motor inrush current.

Reduced Voltage, Solid State Starter: Horsepower shall be rated at 600 volts with overload protection. Starter shall be three-phase, nonreversing with bypass run contactor. Starter shall have kick start with adjustable torque and time settings, ramp start with selectable current or torque, and adjustable time, smooth stop ramp with adjustable time, phase loss unbalance and phase reversal protection, LED display or LCD of fault, normally off contact to communicate fault conditions. Unit shall have a padlockable operating handle, capable of up to three locks.

Combination Adjustable Frequency Drive, Solid State Starter: Drive as specified in Section 16260, Low-Voltage Adjustable Frequency Drive System.

Motor Starters: Microprocessor-based and NEMA-rated. Electrically operated and held, three-pole assemblies controlled by application specific microprocessor. Motor starters shall be equipped with the ability to communicate with MPU and CMU specified in Paragraphs 2.6 and 2.7. Starter contacts shall be replaceable. Starter sizes shall be determined based on motor ratings and the effect of power factor correction capacitor specified in Paragraph 2.9, but shall not be less than the values shown on the Contract Drawings.

Protection Capabilities: Each motor starter shall include the sensor to monitor motor phase currents and provide the following protection:

1. Overcurrent Protection: Measure phase currents to provide motor running overload protection based on motor heating damage boundary. Running overload protection shall be DIP switch-selectable.
2. Phase Loss and Phase Unbalance Protection: DIP switch-settable for selected trip rating.
3. Ground Fault Protection: DIP switch-settable based on maximum continuous ampere rating with start delay and run delay in seconds.

Auxiliary Contacts: Eight reversible contacts for combination of NO or NC, rated 10 amp continuous, 700 VA break for 120V ac. 69 VA make and break for 125V dc.

Each starter unit shall be equipped with a fused control power transformer, two indicating lights (red, green), hand-off-auto (HOA) selector switch, two oiltight pushbuttons (start, stop), and electromechanical non-resettable five-digit elapsed time meter. Control power transformers shall be sized to handle all internal control circuit requirements, plus other external control circuits directly related to MCC functions.

2.7 METERING AND PROTECTION UNIT (MPU)

Each MCC lineup shall be equipped with a microprocessor-based metering and protection device. MPU shall be equipped with an LED display for monitoring incoming power and shall include an ability to report alarm conditions. User shall be able to step through different metering quantities using front panel scroll keys.

Incoming line monitoring capabilities shall include:

1. Phase and line currents and voltages.
2. Current demands (current, watts, vars).
3. Minimum and maximum values (current and voltages).
4. Power factor.

User-programmable alarm contacts and protection functions shall be provided and include:

1. Overvoltage.
2. Undervoltage.
3. Phase loss.
4. Phase unbalance.
5. Phase reversal.

A set of metering grade current transformers shall be furnished with the MPU. Voltage inputs shall be direct connection.

MPU shall be mounted on the MCC door and be self powered or provided with fused CTP for isolated operation.

2.8 COMMUNICATIONS CAPABILITY

Overall networking communications capabilities shall be provided for MPUs and the pump control panel specified in Section 16700, Pump Control Panel, such that they can communicate via Contractor-supplied local area network. Networking may initially be limited between MCC and pump control panel but shall include provisions to include other future control systems.

2.9 POWER FACTOR CORRECTION (ACTIVE FILTER)

2.9.1 Design Requirements

The power correction system (active filter) shall be designed to electronically inject harmonic current to cancel load produced harmonic current such that the upstream power harmonic current and voltage are reduced to below 5 percent TDD and 5 percent THD(V), respectively. TDD as used herein refers to the total load demand of the applied circuit. The applied shall be all the motors connected to the MCC bus. The power correction system shall be capable of correcting for all types of nonlinear loads. Refer to electrical one-line drawings for specific locations. Reactive current compensation (also known as displacement power factor correction) shall be activated or deactivated via a digital keypad/display mounted on the door of the enclosure. When reactive current compensation is activated, the power correction system shall first perform harmonic current correction and then use the remaining capacity to inject reactive current compensation to attain the specified level herein defined.

2.9.2 Performance Requirements

Input Power:

1. Voltage: Automatically adapted to 208-480V, three-phase plus ground.
2. Voltage Tolerance: Plus or minus 10 percent of nominal.
3. Frequency: Automatically adapted to 50 or 60 Hz, plus or minus 3 Hz.
4. Surge Withstand Capability: ANSI/IEEE Std C62.41 without damage.
5. Input Fuses: Rated at 200,000 AIC (amperes interrupting capacity), class T.

Output Performance:

1. Performance of the power correction system shall be independent of the impedance of the power source.
2. Harmonic Correction:
 - a. Limit the 2nd through 50th order harmonic current to <5 percent TDD at each installed location. Harmonic levels for individual harmonic orders shall comply with respective levels established in ANSI/IEEE std 519, Table 10.3.

- b. Limit the THD(V) added to the electrical system immediately upstream of the power correction system location(s) to less than or equal to 5 percent. The power correction system shall not correct for utility supplied voltage distortion levels.
3. Reactive Current Compensation: Reactive current correction is required to maintain a set point of .95 lagging displacement power factor or better under all load conditions. Reactive current compensation shall be dynamic and shall never cause leading displacement power factor to occur.

Current Transducers:

1. Current transducers shall be rated for the total rated rms current of the total load at each installed location or higher.
2. Two current transducers, mounted on phases A and B, are to be installed per location.
3. Each current transducer shall have a current output of 5 amperes. Current capacity of each current transducer shall be 5,000, 3,000, 1,000, or 500, as required for the electrical system where installed. No other ratings are acceptable.
4. Each current transducer shall be rated for 400 hertz.

Enclosure:

1. Each power correction unit shall be provided in an IP-20 (NEMA 1) rated enclosure integrated into the MCC.
2. When indicated in the electrical-mechanical drawings, the power correction system shall be mounted in the motor control center.
3. All units shall include 200,000 AIC rated fuses with class T actuation.
4. All units shall be provided with a grounding lug. Grounding by the Contractor is to be performed according to local and national standards.
5. Paint shall be manufacturer's standard type and color.

Operator Controls and Interface:

1. All units shall include a digital interface model (DIM) that includes an alphanumeric display consisting of two lines with 20 characters per line. All information shall be in English. Display shall be easily viewed under all lighting conditions, including sunlight, as found inside buildings.
2. Operators include run, stop, setup, enter, and up/down scroll.
3. The display shall provide operating data while functioning. Standard operating parameters available for display are ac line voltage, total rms load current, harmonic current of load, reactive current of load, output harmonic and reactive current of power correction system.
4. When the output of the power correction unit is at full rated capacity, the display shall indicate at maximum capacity and actuate an at-maximum capacity relay.

5. All fault conditions shall be displayed as they occur. Diagnostic information shall be provided in English and clearly indicate the nature of the fault.
6. The run pushbutton shall include a green LED. LED shall be lit when unit is operating.
7. Contacts shall be provided for operator information for power –on, run, fault and at-maximum capacity. Each contact shall be rated for 1 ampere at 120/240 volts. One form C contact shall be provided for each relay.
8. A RS485 serial communication port shall be provided.

Design:

1. All power correction units shall be defined as a power electronic device consisting of power semiconductors that switch into the ac lines modulate its output to cancel detrimental harmonic and/or adjust reactive currents. A dc bus shall store power for power semiconductor switching. A microprocessor shall control the operation of the power converter.
2. Each unit shall be designed with a current limiting function to protect the semiconductors. When this level is attained, a message shall be displayed indicating the output capacity is at-maximum capacity and actuate the at-maximum relay. Operation shall continue indefinitely at this level without trip off or destruction of the power correction unit.
3. Each unit shall incorporate an over-temperature output roll back that reduces the total output current in order to maintain maximum current correction within the electrical system.
4. Two distinct levels of faults shall be employed. Non-critical level faults will provide automatic restart and a return to normal operation upon automatic fault clearance. Critical level faults stop the function of the unit and await operator action.
 - a. Faults such as ac line over-voltage, ac line under-voltage, ac line power loss, and ac line phase imbalance shall be automatically restarted. Upon removal of these fault conditions, the power correction system shall restart without user action. Automatic restart will not occur if the 5 faults have occurred in less than 5 minutes. During the fault condition, except line loss, the display shall state the type of fault and indicate that automatic restart will occur. The run relay and run LED shall be disabled. The fault relay shall not be enabled unless time out occurs. Upon ac line loss, the power-on relay shall be disabled and no display shall provided.
 - b. All other types of faults shall be considered critical and stop the power correction system. The display shall indicate the fault condition and “stop.” The run LED and relay shall be disabled and the fault relay enabled. User shall be required to initiate a power reset (turn power off and on) to restart the power correction system.
5. The logic of the power correction system shall monitor the load current by utilizing two current transducers (CTs) mounted on phases A and B to direct the

function of the power electronic converter. The ratio of the CTs must be entered into the logic via the digital keypad/display to calibrate the operation of the power correction system. The output of the current transducers shall be 5 amperes.

2.10 INCOMING FEEDER TERMINATION

Incoming buses shall terminate on main breaker.

If the breaker has marked line and load terminals, incoming line shall be terminated on the line terminals and feed lines shall be terminated on the load terminals.

Feeder Entry: Bottom entry is required. If top entry is proposed, equipment building and pad-mounted oil filled transformer manufacturers must be notified for design coordination. Top entry shall be subject to the approval of the District.

2.11 MAIN BREAKERS

Main breakers shall be molded case three-pole breaker and shall be capable of being electronically tripped.

Main breakers shall be operated by a toggle-type handle and shall have a quick make/quick break over-center switching mechanism that is mechanically trip-free. Automatic tripping of the breaker shall be clearly indicated by the handle position. Contacts shall be non-welding silver alloy, and arc extinction shall be accomplished by means of arc chutes.

Minimum symmetrical interrupting rating shall be 65,000 amp at 480 volts.

Main breakers shall be equipped with the following internal accessories:

1. Alarm contacts (SPDT).
2. Auxiliary contacts ("a" and "b").

Main breakers shall be Cutler-Hammer Type RD Series C with 1,200-amp frame, or approved equal. Electronic trip unit shall be Cutler-Hammer Type Digitrip RMS 510, with long time, short time, and ground fault protection, or approved equal.

2.12 FEEDER BREAKERS

Feeder breakers shall be as shown on the Contract Drawings and as required to meet the requirements of the NEC. Feeder breakers shall be mounted in draw-out compartments.

2.13 PANELBOARDS

2.13.1 General

120/240-Volt panelboards shall be fully rated with short circuit rating not less than 14,000 Amp rms symmetrical.

Panelboards shall be UL-tested and listed and meet NEC and NEMA standards.

Installation Options: Panelboards are intended to be wall mounted.

2.13.2 Construction

Panelboards shall be factory assembled. A directory card with clear plastic cover shall be supplied and mounted on the inside of each door.

Doors shall be lockable and locks shall be keyed alike.

Main bus shall be tin plated copper and sized in accordance with UL standard.

Full size insulated neutral bars shall be furnished.

2.13.3 Circuit Breakers

Breakers shall be molded case type with quick-make, quick-break, over-center, mechanically trip-free switching mechanism. Automatic tripping of breakers shall be clearly indicated by the handle position.

Circuit breakers of 225 amp frame and below shall be provided with thermal-magnetic trip units and inverse time-current characteristics.

Breakers shall be bolt-on type.

Breakers shall be UL listed for application at 100% of the continuous current rating.

Main breakers shall be furnished in accordance with the NEC.

Estimated minimum number of breakers to be supplied:

1. 120/240-volt panelboard: 10-20A single pole, 10-30A 2-pole, 2-40A 2-pole.

2.14 DRY-TYPE TRANSFORMERS

Provide general purpose, indoor type, 480-120/240, single phase, capacity as shown, or as required for estimated loads, whichever is larger. Taps on primary winding shall be plus and minus 5 percent.

Transformers shall be UL-listed, 80 degrees C rise under full load, and meet ANSI standards. Transformers shall be designed for installation within the MCC structure.

2.15 ENCLOSURES

Enclosure shall comply with NEMA 1. Enclosing sheetmetal, wireways and unit doors shall be gasketed.

2.16 FINISH

Provide phosphatizing pretreatment followed by anionic, thermoset acrylic paint. Manufacturer's standard color is acceptable.

Finish shall pass 600 hours of corrosion resistance testing in accordance with ASTM B117.

2.17 SPARE PARTS AND SPECIAL TOOLS

The following spare parts shall be furnished:

1. One (1) each of different motor starter module used.
2. 5 percent of total number of, or 5 each of, all user-replaceable electronic circuit cards or modules utilized in the system, whichever is larger.
3. 5 each of molded case circuit breakers of different ratings used in the panelboards.
4. 1-lot special tools recommended for MCC maintenance and operation.

3.0 EXECUTION

3.1 INSTALLATION AND TESTING

Preinstall MCCs in the pre-engineered Equipment Building specified in Section 13100, Pre-Engineered Buildings, and fully test at the factory prior to delivery.

Perform all tests required by ANSI, NEMA, and UL standards. Provide certified test report.

District's representative may witness the factory testing. Submit test procedures and notify District 4 weeks in advance of the scheduled test.

3.2 INSTALLATION SUPERVISION

Provide manufacturer's representative to assist MCC installation and startup testing onsite. The manufacturer's representative shall supervise the Installing Contractor in general assembly, connections, adjustments, and testing of the assembly and components.

Manufacturer's representative shall supervise the Installing Contractor to perform the following tests:

1. Check all removal cells and start units for easy removal and insertion.
2. Perform insulation tests on each phase and verify low-resistance ground connection on ground bus.
3. Connect all power wiring and control wiring and verify basic operation of each starter from control power source.
4. Torque all bolted connections made in the field and verify all factory bolted connections.
5. Calibrate any solid-state device or control relays for intended purposes and make written notation of adjustments on record drawings.

Submit three copies of field startup report.

3.3 FIELD TESTING

Follow the minimum requirements as stipulated in the NETA testing procedure for motor control center assembly.

Perform communications capabilities as specified.

Submit field report on tests performed and test values experienced.

3.4 MANUFACTURER'S CERTIFICATION

A qualified factory-trained manufacturer's representative shall certify in writing that the equipment has been installed, adjusted, and tested in accordance with the manufacturer's recommendations.

Submit three copies of the manufacturer's representative's certification.

3.5 TRAINING

Provide training sessions for District's personnel during normal working hours at the location designated by the District.

Furnish manufacturer's representative for the following services at jobsite or classroom as designated by Owner for minimum person-days listed below, travel time excluded:

1. 1 person-day for installation assistance, and inspection of installation.
2. 1 person-day for functional and performance testing.
3. 1 person-day for plant startup.
4. 0.5 person-day for training of Owner's personnel.

Training programs shall include the following:

1. Review of MCC one-line diagrams and schedules.
2. Review of factory record shop drawings and placement of various cells.
3. Review of each type of starter cell, components within, control, and power wiring.
4. Review contactor coil replacement and contact replacement procedures.
5. Review of microprocessor-based devices and their operations and maintenance.
6. Review of control and communication capability.
7. Preventive maintenance program and schedule.

Provide total of 8 three-ring binders including training course materials and drawings.

END OF SECTION 16480

SECTION 16700

PUMP CONTROL PANEL

TABLE OF CONTENTS

1.0	GENERAL	2
1.1	SECTION INCLUDES	2
1.2	PUMP CONTROL PANEL FUNCTIONAL REQUIREMENTS	2
1.3	COMMUNICATION CAPABILITY.....	9
1.4	SUBMITTALS	9
1.5	QUALIFICATIONS	10
1.6	SOFTWARE DEVELOPMENT COORDINATION MEETING	10
1.7	DELIVERY, STORAGE, AND HANDLING	10
2.0	PRODUCTS	10
2.1	PROGRAMMABLE LOGIC CONTROLLERS (PLC)	10
2.2	LEVEL TRANSMITTERS.....	11
2.3	LOW FLOW SWITCHES.....	12
2.4	PRESSURE GAUGES.....	12
2.5	PANEL INDICATORS, SWITCHES, AND LIGHTS.....	13
2.6	UNINTERRUPTIBLE POWER SUPPLY	13
2.7	CONTROL PANEL FABRICATION	14
2.8	SOFTWARE.....	14
3.0	EXECUTION	14
3.1	GENERAL	14
3.2	FACTORY TESTS.....	14
3.3	TESTING AND COMMISSIONING	15

SECTION 16700

PUMP CONTROL PANEL

1.0 GENERAL

1.1 SECTION INCLUDES

Pump control panel functional requirements.

Design and coordination with others.

Qualifications.

Delivery, storage, and handling.

1.2 PUMP CONTROL PANEL FUNCTIONAL REQUIREMENTS

1.2.1 General

Pump control panel (PCP) shall be provided to function as the local control center for all pump station control functions. The PCP shall be centrally located in the MCC building; shall be designed to send and receive control, status, and alarm signals directly from pump motors via hard-wire conductors. It is the Contractor's responsibility to coordinate the design of the PCP with the manufacturers of motor control centers and pump motors. Reference the Process and Instrumentation Diagrams, sheets I-1 and I-2, for control signals required to be interfaced to the PLC system in the PCP.

1.2.2 Individual Pump Control and Monitoring

The manufacturer's standard pump control and protection circuitry shall be provided for each pump, along with the additional monitoring and status indication signals listed below. All indication and control functions shall be provided through a programmable logic controller (PLC) provided as part of the PCP except where noted. The PLC shall include a graphical operator interface using a series of screen displays as described in this section.

1.2.3 Control System Communications to External Systems

All control variables that are viewable and adjustable through the PCP graphical operator interface shall be available to external system via the Ethernet control system network.

1.2.4 Loop 100 – Tailrace Water Level Monitoring

1. The PLC system shall continuously monitor the level of the water in the tailrace. The PLC shall compare the water level to High and Low alarm setpoints. If the water exceeds the High setpoint, or falls below the Low setpoint for a preset period of time, the PLC shall annunciate the corresponding alarm on the

graphical operator interface. The setpoints shall be operator adjustable through the graphical operator interface.

2. Status Monitoring and Control Interfaces: The following status and control signals shall be displayed on the graphical operator interface.
 - a. Tailrace water level
 - b. High Level alarm setpoint
 - c. Low level alarm setpoint
3. Alarm Annunciation: The following alarms shall be annunciated on the graphical operator interface:
 - a. Tailrace high water level.
 - b. Tailrace low water level.

1.2.5 Loop 101-105 Pump Control

1. The PLC system shall operate the pumps to maintain an operator entered flow setpoint. The pumps shall be selected based upon Lead/Lag pump selections and a pump selection matrix.
2. Pump Control Modes:
 - a. When the Hand-Off-Remote (HOR) selector switch on the MCC is in Hand position, pump control shall be performed only by the pushbuttons on the MCC. When the HOR switch is in Remote position, control of pumps shall be transferred to the PLC system.
 - b. When in Remote mode, manual control of individual pumps shall be from the Pump Control Panel graphical operator interface. Automatic control of pumps shall be provided as described in this section.
 - c. Pump shutdown for all manufacturer's normal protective circuits shall be active at all times. This control shall be external to the PLC.
3. Pump Lead/Lag Control:
 - a. Adjustable speed pumps P-101 and P-102 shall be configured in a Lead/Lag/Alternate control sequence. When selected to Alternate, the PLC system shall automatically switch lead pumps when both pumps are detected as being off.
 - b. Constant speed pumps P-103, P-104 and P-105 shall be configured in a Lead/Lag 1/Lag 2/Alternate control sequence. When selected to Alternate, the PLC system shall automatically switch lead pumps when both pumps are detected as being off.
 - c. Selection of Lead/lag control mode shall be through the graphical operator interface.
 - d. The Lead/Lag sequences shall determine which pumps are available for service. A pump shall be available if the pump is selected to Remote at the MCC and is not in a failure or pump shutdown condition.
 - 1) If a pump is not available, the control sequence will replace that pump with the next available pump in the sequence.

4. Pump Start/Stop Control:

- a. The PLC control shall start and stop pumps based upon a control matrix that aligns the pumps required based upon the pump station flow setpoint entered by the operator through the graphical operator interface.

Flow Setpoint	Lead Variable	Lag Variable	Lead Constant	Lag 1 Constant	Lag 2 Constant
26 to 52 cfs	X				
53 to 104 cfs	X	X			
105 to 156 cfs	X	X	X		
157 to 208 cfs	X	X	X	X	
209 to 260 cfs	X	X	X	X	X

- b. All flow range and pump selection setting in the matrix shall be operator adjustable through the graphical operator interface.
- c. Provide a pump station Start/Stop control selection on the graphical operator interface. The Start/Stop function shall initiate the following sequences controlled by the PLC system.
 - 1) Start Sequence: The following start sequence shall be configured in the PLC system.
 - a) Start the required variable speed pumps, one at a time. Maintain the pumps at their minimum speed setting.
 - b) Start the required constant speed pumps, one at a time.
 - c) Release the variable speed pumps to be speed controlled by the pump speed control system.
 - 2) Stop Sequence: The following stop sequence shall be configured in the PLC system.
 - a) Ramp the speed of the operating variable speed pumps to their minimum speed.
 - b) Stop the operating constant speed pumps, one at a time.
 - c) Stop the operating variable speed pumps, one at a time.
 - 3) Provide an operator adjustable time delay setpoint to control the time between pump starts in the start and stop sequence.
- d. The PLC shall monitor each pump for failure to respond to a start or stop command. If the PLC issues a start or stop command to a pump and it's associated status feedback signal is not received within 10 seconds, the PLC system shall:
 - 1) Remove the pump start command and tag the pump as not available.

- 2) Annunciate the failure alarm on the graphical operator interface.
 - a) Once initiated, the pump failure alarm shall remain active until one of the following conditions occurs:
 - (1) The pump alarm Reset function is selected through the graphical operator interface.
 - (2) The pump is taken out of Remote at the MCC.
5. Pump Speed Control:
 - a. The speed of the variable speed pumps shall be modulated to maintain an operator entered flow setpoint. A Proportional/Integral (PI) controller programmed in the PLC system shall be used to determine the required pump speed to maintain the pump station flow rate.
 - b. Provide display of and operator access to the following PI controller operating variables:
 - 1) Controller mode.
 - 2) Controller process variable (Canal flow).
 - 3) Controller setpoint.
 - 4) Controller output.
 - c. Provide display of and password protected access to the following PI controller tuning variables:
 - 1) Controller sample rate.
 - 2) Controller gain.
 - 3) Controller integral.
6. Pump Suction Differential Monitoring:
 - a. The PLC system shall continuously subtract the level of the water in each pumps suction pipe, as measured by LT-101 through 105, from the level of the tailrace as measured by LT-100. The PLC shall compare the resulting level differential for each pump to operator adjustable Medium, High and High-High level differential setpoint for each pump. If a pumps differential exceeds that pumps Medium, High or High-High differential setpoint for a preset period of time, the PLC shall:
 - 1) Command the backwash system to start a backwash cycle (Medium only).
 - 2) Stop the pump and tag the pump as not available. (High-High only).
 - 3) Annunciate the High and High-High differential alarms on the graphical operator interface.
 - b. If LT-101 is detected as failed, the PLC system shall automatically disable the differential monitoring system without interrupting pump operation.
 - 1) Annunciate the transmitter failure and differential system disable conditions on the graphical operator interface.
 - c. Once initiated, the High-High differential alarm shall remain active until one of the following conditions occurs:
 - 1) The pump alarm Reset function is selected through the graphical operator interface.
 - 2) The pump is taken out of Remote at the MCC.

- d. The differential setpoints shall be operator adjustable through the graphical operator interface.
- 7. Pump Suction Level Monitoring:
 - a. The PLC system shall continuously monitor each pump suction level as measured by LT-101 through 105 and compare the levels to an operator adjustable low level setpoint. If a pump's suction level falls below the low level setpoint for a preset period of time, the PLC shall:
 - 1) Stop the pump and tag the pump as not available.
 - 2) Annunciate the pump low level shutdown alarm on the graphical operator interface.
 - b. Once initiated, the pump low level alarm shall remain active until one of the following conditions occurs:
 - 1) The pump alarm Reset function is selected through the graphical operator interface.
 - 2) The pump is taken out of Remote at the MCC.
 - c. The low suction level setpoint shall be operator adjustable through the graphical operator interface.
- 8. Pump Low Flow Monitoring:
 - a. The PLC system shall continuously monitor the status of the low flow switch installed on each pumps discharge pipe. When a pump is started, the PLC shall start a 30-second delay timer. When the delay time expires, the PLC shall activate the pumps low flow alarm function. While the low flow alarm function is activate, and a low flow condition is detected for a preset period of time, the PLC shall:
 - 1) Stop the pump and tag the pump as not available.
 - 2) Annunciate the Low flow alarm on the graphical operator interface.
 - b. Once initiated, the Low flow alarm shall remain active until one of the following conditions occurs:
 - 1) The pump alarm Reset function is selected through the graphical operator interface.
 - 2) The pump is taken out of Remote at the MCC.
- 9. Pump Run Time/Starts Monitoring:
 - a. The PLC shall calculate the run time for each pump. The run time shall be calculated in tenths of hours.
 - b. The PLC system shall maintain a total of the number of starts for each pump.
 - c. The run time and number of starts shall be displayed on the graphical operator interface.
 - d. Provide a Reset function on the graphical operator interface to allow each pump run time and starts count to be individually reset.
- 10. Status Monitoring and Control Interfaces: The following status and control signals shall be displayed on the graphical operator interface.
 - a. Pump Station Start/Stop Control.
 - b. Time delay between pump starts and stops setpoint.
 - c. Pump flow range matrix setpoints.

- d. Pump (PI) flow controller operating variables.
 - e. Pump (PI) flow controller tuning variables.
 - f. Pump in Remote (Each pump).
 - g. Pump available (Each pump).
 - h. Pump Start/Stop (Each pump).
 - i. Pump running (Each pump).
 - j. Pump run time (Each pump).
 - k. Pump starts (Each pump).
 - l. Pump run time/starts Reset (Each pump).
 - m. Pump speed indication (Variable speed pumps).
 - n. Pump speed command (Variable speed pumps).
 - o. Pump Lead/Lag/Alternate status.
 - p. Pump Lead/Lag/Alternate selection.
 - q. Pump suction water level (Each pump).
 - r. Pump suction/screen differential water level (Each pump).
 - s. Pump alarm Reset (Each pump).
 - t. Pump suction/screen Medium, High and High-High differential water level setpoint (Each pump).
 - u. Automatic transfer switch status signals.
11. Alarm Annunciation: The following alarms shall be annunciated on the graphical operator interface:
- a. Pump motor over-temperature (each pump).
 - b. Pump motor seal enclosure high water alarm (each pump).
 - c. Pump suction/screen High differential water level (each pump).
 - d. Pump suction/screen High-High differential water level (each pump).
 - e. Pump Failure (each pump).
 - f. VFD Fault (variable speed pumps).
 - g. Pump Low flow (each pump).
 - h. Automatic transfer switch alarms.

1.2.6 Loop 111 – Canal Flow Monitoring

1. The PLC system shall continuously monitor the flow in the canal. The PLC shall compare the flow rate to High and Low alarm setpoints. If the flow exceeds the High setpoint, or falls below the Low setpoint for a preset period of time, the PLC shall annunciate the corresponding alarm on the graphical operator interface.
 - a. The High and Low setpoints shall be operator adjustable plus or minus deviation limit from the pump station flow setpoint.
 - b. The deviation limit shall be adjustable through the graphical operator interface.
2. Status Monitoring and Control Interfaces: The following status and control signals shall be displayed on the graphical operator interface.
 - a. Canal flow rate.
 - b. High flow alarm setpoint.

- c. Low flow alarm setpoint.
- d. Flow deviation limit.
- 3.. Alarm Annunciation: The following alarms shall be annunciated on the graphical operator interface:
 - a. Canal High flow.
 - b. Canal Low Flow.

1.2.7 Loop 121 – Air Backwash System Monitoring and Control

- 1. The PLC system shall command the backwash system to execute a backwash sequence when the level differential between the tailrace and any pump suction pipe exceeds the Medium level setpoint. See Loops 101 through 105.
- 2. Status Monitoring and Control Interfaces: The following status and control signals shall be displayed on the graphical operator interface.
 - a. Backwash system in Auto.
- 3. Alarm Annunciation: The following alarms shall be annunciated on the graphical operator interface:
 - a. Backwash system Fault.

1.2.8 Loop 131 - Canal Outlet Structure

- 1. Canal Level Differential Monitoring:
 - a. The PLC system shall continuously subtract the level of the water downstream of the outlet screen, as measured by LT-131-2 from the canal level upstream of the outlet screen as measured by LT-131-1. The PLC shall compare the resulting level differential to operator adjustable High and High-High level differential setpoints. If the level differential exceeds the High or High-High differential setpoint for a preset period of time, the PLC shall:
 - 1) Annunciate the High and High-High differential alarms on the graphical operator interface.
 - b. The level differential setpoints shall be operator adjustable through the graphical operator interface.
- 2. Status Monitoring and Control Interfaces: The following status and control signals shall be displayed on the graphical operator interface.
 - a. Canal level upstream of the outlet screen
 - b. Canal level downstream of the outlet screen
 - c. Outlet level differential
 - d. High differential alarm setpoint
 - e. High-High differential alarm setpoint
- 3. Alarm Annunciation: The following alarms shall be annunciated on the graphical operator interface:
 - a. High outlet level differential
 - b. High-High outlet level differential

1.2.9 Graphical Operator Interface Displays

The graphical operator interface system shall be provided with the following screens as minimum:

1. Pump station control screen, with control input fields (flow set point, pump start/stop) and primary operating data (flow and pumps running).
2. Pump station summary screen, with pumps available, pumps out of service, pump run time hours, total flow, water levels and other summary data.
3. Alarms: For all pumps and system alarms.
4. Data logging screen, with alarm history, power consumption data and individual pump run-time hours.
5. Other screens as required for system monitoring and programming.

1.3 COMMUNICATION CAPABILITY

PCP shall be configured for communication on Contractor-furnished Ethernet based local area network. The communication network shall be designed to communicate with all addressable devices in the motor control centers, the PCP, and the control system in the powerhouse.

Provide all required networking hardware within the PCP to allow the PCP control system to interface with the existing powerhouse control network.

1.4 SUBMITTALS

Submit in accordance with Section 01300, Administrative Requirements.

Submit the following data:

1. Control panel internal and external layout.
2. Remote I/O rack (if used) internal component layout.
3. Internal schematic diagrams.
4. External connection diagrams.
5. Cable and conduit schedules showing identifications for all field wiring.
6. Manufacturers' data sheets for PLC modules and other materials.
7. Fully annotated PLC application program listing in printed form and electronically in native programming software file format.
8. Copies of all operator interface graphic displays with descriptions of configured functions for each display. Provide in printed form and electronically in native programming software file format.

1.5 QUALIFICATIONS

Manufacturer of the control panel shall have been engaged in a similar line of work for a minimum of 10 years, including programming of control software and design of PLC-based graphical user interface. Programmers and designers shall be permanently employed by the manufacturer and shall not be temporary or subcontracted employees.

When requested by Engineer, an acceptable list of installations with similar equipment shall be provided to demonstrate compliance with these requirements.

1.6 SOFTWARE DEVELOPMENT COORDINATION MEETING

The Contractor shall produce all PLC and graphical operator interface programming to match District programming standards.

Prior to beginning any programming activities, the Contractor shall attend a software coordination meeting. The purpose of the meeting is to review the District programming standards and to provide the Contractor with requested information related to the standards.

1.7 DELIVERY, STORAGE, AND HANDLING

Equipment shall be handled and stored in accordance with manufacturer's instructions.

The control panel shall be delivered preinstalled in the MCC building specified in Section 13100, Pre-Engineered Buildings.

2.0 PRODUCTS

2.1 PROGRAMMABLE LOGIC CONTROLLERS (PLC)

Specific quantities and model numbers shall be determined by the Contractor based on the requirements of the PCP. All modules and accessories shall be supplied by Allen-Bradley. The following models are listed for reference only.

1. Processor Module: SLC 5/05 Series C.
2. Display: Panelview 1000, grayscale/keypad with two RS-232 communications ports, Model 2711-T10G16.
3. Digital Input Module: 1746-IA16.
4. Digital Output Module: 1746-OW16.
5. Analog Output Modules: 1746-NO4I.
6. Scanner Module: 1747-SN.
7. Expansion Rack: 1746-A7, or as required.
8. Power Supply Module: 1746-P2.
9. Interconnection Cable: 1746-C7.

Mounting Rails and Terminal Blocks:

1. Mounting Rails: 1492-N1.
2. Terminal Blocks: 1492-CA1.
3. End Barrier: 1492-N16.
4. End Anchor: 1492-N23.

Communication Cable: Belden "Blue Hose," No. 9463. No substitution.

2.2 LEVEL TRANSMITTERS

Submersible type level transmitters shall be provided. Transmitters shall be 2-wire instruments providing a 4-20 mA signal proportional to liquid level above the sensor. Type 316 stainless steel construction with sealed polyurethane cable and integral breather tube.

All mounting hardware, desiccant termination junction boxes and electrical cable to carry the signal to the junction box shall also be provided.

Transmitters shall be:

1. Druck, Model PTX 1730.
2. KPSI, Series 300.
3. Approved equal.

The transmitters shall be configured as follows:

1. LIT-100: Pump station upstream level.
 - a. Scale Range: 0-20 feet.
 - b. Cable Length: As required, coordinate with construction contractor.
2. LIT-101: Pump No. 1 screen intake level.
 - a. Scale Range: 0-20 feet.
 - b. Cable Length: As required, coordinate with construction contractor.
3. LIT-102: Pump No. 2 screen intake level.
 - a. Scale Range: 0-20 feet.
 - b. Cable Length: As required, coordinate with construction contractor.
4. LIT-103: Pump No. 3 screen intake level.
 - a. Scale Range: 0-20 feet.
 - b. Cable Length: As required, coordinate with construction contractor.
5. LIT-104: Pump No. 4 screen intake level.
 - a. Scale Range: 0-20 feet.
 - b. Cable Length: As required, coordinate with construction contractor.
6. LIT-105: Pump No. 5 screen intake level.
 - a. Scale Range: 0-20 feet.
 - b. Cable Length: As required, coordinate with construction contractor.

7. LIT-131-1: Outlet structure level – upstream of screen.
 - a. Scale Range: 0-20 feet.
 - b. Cable Length: As required, coordinate with construction contractor.
8. LIT-131-2: Outlet structure level – downstream of screen.
 - a. Scale Range: 0-20 feet.
 - b. Cable Length: As required, coordinate with construction contractor.

2.3 LOW FLOW SWITCHES

Thermal low flow switches shall be provided. Switches shall be:

1. Fluid Components Inc., Model FLT 93S.
2. Approved equal.

The flow switches shall be configured as follows:

1. FSL-101: Pump No. 1 low flow switch.
 - a. Flow Range: 0-60 CFS.
 - b. Setpoint: 23 CFS.
 - c. Insertion Length: 18 inches.
2. FSL-102: Pump No. 2 low flow switch.
 - a. Flow Range: 0-60 CFS.
 - b. Setpoint: 23 CFS.
 - c. Insertion Length: 18 inches.
3. FSL-103: Pump No. 3 low flow switch.
 - a. Flow Range: 0-60 CFS.
 - b. Setpoint: 23 CFS.
 - c. Insertion Length: 18 inches.
4. FSL-104: Pump No. 4 low flow switch.
 - a. Flow Range: 0-60 CFS.
 - b. Setpoint: 23 CFS.
 - c. Insertion Length: 18 inches.
5. FSL-105: Pump No. 5 low flow switch.
 - a. Flow Range: 0-60 CFS.
 - b. Setpoint: 23 CFS.
 - c. Insertion Length: 18 inches.

2.4 PRESSURE GAUGES

Pressure gauges shall be provided to measure pump discharge pressure. Pressure gauges shall have the following features:

1. Gauge Type: Bourdon tube.
2. Dial Size: 4-1/2 inches.
3. Liquid Fill: Glycerine.
4. Case Material: Black thermoplastic.

5. Materials of Wetted parts: Type 316 stainless steel.
6. Adjustable pointer.
7. Window: Glass or acrylic.
8. Case Type: Solid front with blow-out back.
9. Process Connection: 1/2-inch MNPT.
10. Accessories:
 - a. Throttling device.
 - b. Over Range Stop

Pressure gauges shall be:

1. Ashcroft Duragauge Model 1259/1279.
2. Amatek, U.S. Gauge; Solfrunt Model 19XX/1981.
3. Approved equal.

The pressure gauges shall be configured as follows:

1. PI-101: Pump No. 1 discharge pressure.
 - a. Range: 0-15 PSI.
2. PI-102: Pump No. 1 discharge pressure.
 - a. Range: 0-15 PSI.
3. PI-103: Pump No. 1 discharge pressure.
 - a. Range: 0-15 PSI.
4. PI-104: Pump No. 1 discharge pressure.
 - a. Range: 0-15 PSI.
5. PI-105: Pump No. 1 discharge pressure.
 - a. Range: 0-15 PSI.

2.5 PANEL INDICATORS, SWITCHES, AND LIGHTS

Indicators, switches, and indicating lights shall be NEMA 12 construction and shall be included as required.

2.6 UNINTERRUPTIBLE POWER SUPPLY

The pump control panel shall be provided with an uninterruptible power supply (UPS) that shall provide a minimum of 30 minutes of backup power for the control system. All control panel components with the exception of internal convenience lights and power receptacles shall be powered by the UPS system.

Provide a bypass mechanism to allow the UPS to be de-energized for service without interrupting the use of the pump station control system.

Mount the UPS system on the floor of the pump control panel.

2.7 CONTROL PANEL FABRICATION

Control panel shall be a free-standing NEMA 12 cabinet.

Control panel shall be constructed to meet UL 508A standards. The assembled control panel shall bear a UL label to certify that the panel meets UL 508A requirements.

2.8 SOFTWARE

Operating systems, control logic, and graphical user interface software shall be provided to suit the functional requirements specified and shall be compatible with hardware selected.

Programming software shall be provided to enable revisions and updates to control logic and screen graphics that may be performed by the District's staff using personal computers.

Include full documentation for software used.

3.0 EXECUTION

3.1 GENERAL

Workmanship shall comply with all applicable provisions of NECA 5055.

Ground equipment, enclosures, and complete conduit system securely in accordance with applicable sections of NEC.

Install all wiring external to control panels in conduit and route such that no part of wiring is exposed to potential damage.

3.2 FACTORY TESTS

Perform factory test to demonstrate control panel conform to functional and interface requirements of these Specifications.

Submit test procedures detailing step-by-step test procedures and course of action dealing with failed test items. Submit procedures at least 2 weeks in advance of the scheduled test.

Representatives of the District may witness the tests. Notify at least 4 weeks in advance of scheduled tests.

Shipment of control panel is contingent upon acceptance of factory test by the District.

3.3 TESTING AND COMMISSIONING

Cooperate with the District personnel to demonstrate correct operations of control panel functions, including screen graphics and manual control functions.

Calibrate all sensors, outputs, polarity, and panel displays.

END OF SECTION 16700