

**BONNEY LAKE NOTICE TO CONTRACTORS FOR  
Lift Station 7 SCADA Upgrade  
March 31, 2021**

The City of Bonney Lake has reviewed the MRSC roster and would like to solicit interest from contractors with expertise for electrical and control system installation services in sanitary sewer lift stations. We have short listed contractors that have past experience with control system installation projects.

**PROJECT DESCRIPTION**

The City of Bonney Lake is requesting proposals from qualified contractors for electrical and control system installation services. The Work consists of the fabrication of lift station telemetry panels. This project also consists of the replacement of existing telemetry equipment at the City's Lift Station No. 7.

**SUBMITTAL**

As a contractor on the MRSC roster and experience with expertise for electrical and control system installation services in sanitary sewer lift stations, please provide a proposal that includes all costs including tax to complete the Lift Station 7 SCADA Upgrade included in the submittal packet. Please submit your proposal via email by no later than 3:00 pm on **Tuesday, April 13, 2021**. Any questions regarding this project should be directed to Douglas Budzynski, Assistant City Engineer at [budzynskid@cobl.us](mailto:budzynskid@cobl.us).

The Recipient, in accordance with Title VI of the Civil Rights Act of 1964, 78 Stat. 252, 42 U.S.C. 2000d to 2000d-4 and Title 49, Code of Federal Regulations, Department of Transportation, Subtitle A, Office of the Secretary, Part 21, Nondiscrimination in Federally-assisted programs of the Department of Transportation issued pursuant to such Act, hereby notifies all bidders that it will affirmatively ensure that in any contract entered into pursuant to this advertisement, disadvantaged business enterprises as defined at 49 CFR Part 26 will be afforded full opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, national origin, or sex in consideration for an award.

**CITY OF BONNEY LAKE**  
*Lift Station 7 SCADA Upgrade*  
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# EXHIBIT A



Exhibit A

**City of Bonney Lake**  
***Small Public Works Project***  
**Prevailing Wages Are Required To Be Paid**

Request for Proposal  
**Date: March 31, 2021**

The City of Bonney Lake is accepting proposals for a Small Public Works Project. As a contractor on our Small Works Roster, you are invited to submit a proposal on this project.

**Project Title: Lift Station 7 SCADA Upgrade**

**Scope of Work:**

The City of Bonney Lake is requesting proposals from qualified contractors for electrical and control system installation services. The Work consists of the fabrication of lift station telemetry panels. This project also consists of the replacement of existing telemetry equipment at the City's Lift Station No. 7.

**Prevailing Wage:**

Contractor shall pay all laborers, workers, or mechanics performing work Prevailing Wages as required by Ch.39.12 RCW, and shall satisfy all other requirements of that chapter, including without limitation requiring that all subcontractors performing work related to the project comply with the requirements of that chapter. The hourly minimum rate of wage which may be paid to laborers, workers or mechanics for work related to this project with the Effective Date: **March 31, 2021.**

***<https://fortress.wa.gov/lni/wagelookup/prvWagelookup.aspx>***

Please find enclosed: Proposal Sheet (Exhibit B), Lift Station 7 SCADA Upgrade Plan Set, Specifications, Small Public Works Contract, and Certification of Compliance with Wage Payment Statutes.

**Proposal Submittal Deadline: Tuesday, April 13, 2021 by 3:00 pm.**

Please email Proposal Sheet, Certification of Compliance with Wage Payment Statutes, and signed Small Public Works Contract to [budzynskid@cobl.us](mailto:budzynskid@cobl.us). If you have any questions please contact Douglas Budzynski at (253) 447-4342.

## ***PROPOSER'S CHECKLIST***

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The Proposer's attention is especially called to the following forms, which must be completed in full as required and submitted collectively as the Proposal package:

- Proposal (Exhibit B)**
- Schedule of Prices**
- Certification of Compliance with Wage Payment Statutes**

The following forms are to be executed and submitted within 20 calendar days after receiving the Notice To Award of the Contract.

- Small Public Works Contract**
- Declaration of Option for Performance Bond or Additional Retainage (10% in lieu of Performance Bond) – for Contracts under \$150,000**
- Certificate of Insurance**
- Certificate as to Corporate Principal**
- Certificate as to Corporate Seal**
- W-9 Request for Taxpayer Identification Number and Certification**
- City of Bonney Lake Business License (Copy of active business license due prior to Notice to Proceed**
- Warranty and Defect Bond (Required after Notice of Completion at 15% of contract)**
- Contractor's Declaration of Option for Management of Statutory Retained Percentage - Required if contract is over \$150,000**
- Performance and Guaranty Bond - Required if contract is over \$150,000**
- Labor and Material Payment Bond – Required if contract is over \$150,000**

# EXHIBIT B



Exhibit B  
**City of Bonney Lake**  
*Small Public Works Project*  
**Proposal Sheet**

Company Name: \_\_\_\_\_

Address: \_\_\_\_\_

Phone Number: \_\_\_\_\_

Contact Name: \_\_\_\_\_

**Project Title: Lift Station 7 SCADA Upgrade**

Having carefully examined all documents enclosed herein, the Contractor proposes to perform all work in strict compliance with all documents, for the amount set forth below.

Schedule: Work shall be completed within **Seventy (70)** consecutive work days after the indicated starting date appearing in an official "Notice to Proceed" issued by Bonney Lake. Liquidated damages shall be imposed as specified in the contract documents for each day Contractor fails to meet the completion date.

Dated this \_\_\_\_\_ day of \_\_\_\_\_, in the year of \_\_\_\_\_.

By: \_\_\_\_\_

Title: \_\_\_\_\_

## Lift Station 7 SCADA Upgrade

### SCHEDULE OF PRICES

ITEM NO.	DESCRIPTION OF ITEM	QUANTITY	UNITS	UNIT PRICE	TOTAL PRICE
1	Mobilization, Demobilization, Site Preparation, and Cleanup. (max 10% of Schedule A bid)	1	LS	\$ _____	\$ _____
	(Unit Price in Words) Per LS				
2	Electrical Installation at Lift Station No. 7	1	LS	\$ _____	\$ _____
	(Unit Price in Words) Per LS				
3	Automatic Control at Lift Station No. 7	1	LS	\$ _____	\$ _____
	(Unit Price in Words) Per LS				

**Total Proposal Items (Items 1 Through 3):** \$ \_\_\_\_\_

**Washington State Sales Tax (9.3% of Total Proposal)** \$ \_\_\_\_\_

**Total Proposal** \$ \_\_\_\_\_



**CITY OF BONNEY LAKE  
SMALL PUBLIC WORKS CONTRACT**

**THIS SMALL PUBLIC WORKS CONTRACT** (this "Contract") is made this \_\_\_ day of \_\_\_\_\_, 2021, by and between, the **CITY OF BONNEY LAKE**, a municipal corporation ("City") and \_\_\_\_\_, a \_\_\_\_\_ corporation ("Contractor") Parties (individually a "Party" and collectively the "Parties").

In consideration of the terms and conditions set forth in this Contract, the Parties agree as follows:

**1. Contractor Services.** The Contractor shall furnish at its own cost and expense all labor, tools, materials and equipment required to construct and complete in a good workmanlike manner, and to the satisfaction of the City, the public works project known as Lift Station 7 SCADA Upgrade ("Project"). The Project is detailed in the Scope of Work, Exhibit A, and the following documents, which are attached hereto and incorporated herein by reference unless waived by the City in accordance with Project needs and State law:

- Plans and Contract Drawings
- Scope of Work (Exhibit A)
- Proposal Sheet (Exhibit B)
- Specifications
- Special Provisions (if applicable)
- Declaration of Option for Performance Bond or Additional Retainage (10% in lieu of)
- Certification of Compliance with Wage Payment Statutes
- Schedule of Prevailing Wages <https://fortress.wa.gov/lni/wagelookup/prvWagelookup.aspx>

**2. Notice to Proceed; Time of Completion.** The Contractor shall commence work within seven (7) days after the City issues a written Notice to Proceed, and shall complete the work within 70 consecutive working days from the City's issuance of the Notice to Proceed. The time of beginning, rate of progress and time of completion are essential conditions of this Contract.

**3. Payment.**

**3.1 Payment amount and procedures.** The City shall pay the Contractor for all work and services covered by this Contract in an amount that shall not exceed \_\_\_\_\_ Dollars ( \_\_\_\_\_ ), including applicable sales tax. The payment amount shall exclude approved change orders, in accordance with the quantity and unit prices shown on the attached bid proposal. The Contractor shall submit monthly invoices for work and services performed in a previous calendar month in a format acceptable to the City. The City shall pay for the portion of the work described in the invoice that has been completed by Contractor and approved by the City. The City's payment shall not constitute a waiver of the City's right to final inspection and acceptance of the work.

**3.2 Defective or Unauthorized Work.** If during the course of the Contract, the work rendered does not meet the requirements set forth in the Contract, the Contractor shall correct or modify the required work to comply with the requirements of the Contract. The City shall have the right to withhold payment for such work until it meets the requirements of the Contract. If the Contractor is unable, for any reason, to satisfactorily complete any portion of the work, the City may complete the work by contract or otherwise, and the Contractor shall be liable to the City for any additional costs incurred by the City. "Additional costs" means all reasonable costs incurred by the City, including legal costs and attorneys' fees, beyond the maximum contract price under this Contract. The City further reserves the right to deduct the cost to complete the work, including any additional costs, from any amounts due or to become due to the Contractor.

**3.3 Final Payment; Waiver of Claim.** Thirty (30) days after completion and final acceptance of the Project by the City as complying with the terms of this Contract, the City shall pay to the Contractor all sums due as provided by this Contract except those required to be withheld by law or agreed to in special contract provisions. THE CONTRACTOR'S ACCEPTANCE OF FINAL PAYMENT (EXCLUDING WITHHELD RETAINAGE) SHALL CONSTITUTE A WAIVER OF CLAIMS, EXCEPT THOSE PREVIOUSLY AND PROPERLY MADE AND IDENTIFIED BY THE CONTRACTOR AS UNSETTLED AT THE TIME REQUEST FOR FINAL PAYMENT IS MADE.

**3.4 Retainage.** Where retainage is required, the City shall hold back a retainage in the amount of five percent (5%) of any and all payments made to the Contractor for a period of sixty (60) days after the date of final acceptance, or until receipt of all necessary releases from the State Department of Revenue and the State Department of Labor and Industries, and until settlement of any liens filed under Chapter 60.28 RCW, whichever is later.

**4. Prevailing Wage.** The Contractor shall comply with and pay prevailing wages as required by Chapter 39.12 RCW, as it may be amended in the future. No worker, laborer or mechanic employed in the performance of any part of this Contract shall be paid less than the prevailing rate of wage as determined by the Industrial Statistician of the Department of Labor and Industries for the State of Washington.

Prior to making any payment under this Contract, the Contractor must submit to the City an approved copy of the "Statement of Intent to Pay Prevailing Wages" from the Department of Labor and Industries. It is the Contractor's responsibility to obtain and file the Statement. The Contractor shall be responsible for all filing fees. Notice from Contractor and all subcontractors of intent to pay prevailing wages and prevailing wage rates for the Project must be posted for the benefit of the workers. Each invoice shall include a signed statement that prevailing wages have been paid by the Contractor and all subcontractors. Following the final acceptance of services rendered, Contractor shall submit a "Minimum Wage Affidavit" for themselves and any subcontractors.

In case any dispute arises as to what are the prevailing rates of wages for work of a similar nature and such dispute cannot be adjusted by the parties of interest, including labor and management representatives, the matter shall be referred for arbitration to the Director of the Department of Labor and Industries of the State and his/her decision therein shall be final and conclusive and binding on all parties involved in the dispute as provided for by RCW 39.12.060, as it may be amended in the future.

**5. Indemnification and Hold Harmless.** The Contractor shall protect, defend, indemnify and hold harmless the City, its officers, officials, employees, agents and volunteers from any and all claims, risks, injuries, damages, losses, suits, judgments, and attorney's fees or other expenses of any kind arising out of or in any way connected with the performance of this Contract, except for injuries and damages caused by the sole negligence of the City. The City's inspection or acceptance of any of the work shall not be grounds to avoid any of these covenants of indemnification.

Should a court of competent jurisdiction determine that this Contract is subject to RCW 4.24.115, then, in the event of liability for damages arising out of bodily injury to persons or damages to property caused by or resulting from the concurrent negligence of the Contractor and the City, its officers, officials, employees, agents and volunteers, the Contractor's liability under this section shall be only to the extent of the Contractor's negligence.

It is further specifically and expressly understood that the indemnification provided under this section constitutes the Contractor's waiver of immunity under Industrial Insurance, Title 51 RCW, solely for the purposes of this indemnification. This waiver has been mutually negotiated by the parties.

The provisions of this section shall survive the expiration or termination of this Contract.

**6. Compliance with Laws.** The Contractor shall comply with all federal, state and local laws and regulations applicable to the work done under this Contract. Any violation of the provisions of these applicable laws and regulations shall be considered a violation of a material provision of this Contract and shall be grounds for cancellation, termination or suspension of the Contract by the City, in whole or in part, and may result in ineligibility for further work for the City.

**7. Job Safety.**

**7.1 Work Site Safety.** Contractor shall take all necessary precaution for the safety of employees on the work site and shall comply with all applicable provisions of federal, state and local regulations, ordinances and codes. Contractor shall erect and properly maintain, at all times, as required by the conditions and progress of the work, all necessary safeguards for the protection of workers and the public and shall post danger signs warning against known and unusual hazards.

**7.2 Trench Safety.** All trenches shall be provided with adequate safety systems as required by Chapter 49.17 RCW and WAC 296-155-650 and 655. Contractor is responsible for providing the competent person and registered professional engineer required by WAC 296-155-650 and 655.

**8. Utility Location.** Contractor is solely responsible for locating any underground utilities affected by the work and is deemed to be an "excavator" for the purposes of Chapter 19.122 RCW, as amended. Contractor shall be responsible for compliance with Chapter 19.122 RCW including utilization of the "one call" locator system, before commencing any excavation activities.

**9. Warranty and Guarantee.** Contractor shall warrant and guarantee the materials and work to be free of defects for a period of two (2) years after the City's final acceptance of the entire

Project. Contractor shall be liable for any costs, losses, expenses or damages including consequential damages suffered by the City resulting from defects in the Contractor's work including, but not limited to, cost of materials and labor expended by the City in making emergency repairs and cost of engineering, inspection and supervision by the City. The Contractor shall hold the City harmless from any and all claims, which may be made against the City as a result of any defective work, and the Contractor shall defend any claims at its own expense. Where materials or procedures are not specified in the Contract, the City will rely on the professional judgment of the Contractor to make the appropriate selections.

**10. Correction of Defects.** Contractor shall be responsible for correcting all defects in workmanship and/or materials discovered after the acceptance of this work. When corrections of defects are made, Contractor shall be responsible for correcting all defects in workmanship and/or materials in the corrected work for one year after the acceptance of the corrections of the City. The Contractor shall start work to remedy such defects within seven (7) days of the City's mailed notice of discovery, and shall complete such work within a reasonable time agreed to by both parties. In emergencies where damage may result from delay or where loss of service may result, such corrections may be made by the City, in which case the Contractor shall pay all costs incurred by the City to perform the correction. In the event the Contractor does not accomplish corrections within the time specified, the correction work will be otherwise accomplished by the City and all costs of same shall be paid by the Contractor.

**11. Change Order/Contract Modification.**

**11.1 Amendments.** This Contract, together with attachments and/or other addenda, represents the entire and integrated Contract between the parties hereto and supersedes all prior negotiations, representations, or agreements, either written or oral. This Contract may be amended, modified or added to only by written change order properly signed by both parties.

**11.2 Change orders.** The City may issue a written change order for any change in the work during the performance of this Contract. If the Contractor determines, for any reason, that a change order is necessary, the Contractor must submit a written change order request to the City within fourteen (14) calendar days of the date the Contractor knew or should have known of the facts and events giving rise to the requested change. If the City determines that the change increases or decreases the Contractor's costs or time for performance, the City will make an equitable adjustment. The City will attempt, in good faith, to reach agreement with the Contractor on all equitable adjustments. If the parties are unable to agree, the City will determine the equitable adjustment as it deems appropriate. The Contractor shall proceed with the change order work upon receiving the written change order. If the Contractor fails to require a change order within the time frame allowed, the Contractor waives its right to make any claim or submit subsequent change order requests for that portion of the work. If the Contractor disagrees with the equitable adjustment, the Contractor must complete the change order work; however, the Contractor may elect to protest the adjustment as provided below.

**11.3 Procedure and Protest by Contractor.** If the Contractor disagrees with anything required by a change order, another written order, or an oral order from the City, including any direction, instruction, interpretation, or determination by the City, the Contractor shall, within fourteen (14) calendar days, provide a signed written notice of protest to the City that states the date of the notice of the protest, the nature and circumstances that caused the protest, the provisions

of the Contract that support the protest, the estimated dollar cost, if any, of the protested work and how the estimate was determined, and an analysis of the progress schedule showing the schedule change or disruption, if applicable. The Contractor shall keep complete records of extra costs and time incurred as a result of the protested work. The City shall have access to any of the Contractor's records needed to evaluate the protest. If the City determines that a protest is valid, the City will adjust the payment for work or time by an equitable adjustment.

**11.4 Failure to Protest or Follow Procedures Constitutes Waiver.** By not protesting or failing to follow procedures as this section provides, the Contractor waives any additional entitlement or claims for protested work, and accepts from the City any written or oral order (including directions, instructions, interpretations, and determinations).

**11.5 Contractor's Duty to Complete Protested Work.** In spite of any protest, the Contractor shall proceed to promptly complete work that the City has ordered.

**11.6 Contractor's Acceptance of Changes.** The Contractor accepts all requirements of a change order by: (1) endorsing the change order; (2) writing a separate acceptance; or (3) not protesting in the manner this section provides. A change order that is accepted by the Contractor as provided herein shall constitute full payment and final settlement of all claims for contract time and for direct, indirect, and consequential costs, including costs of delays related to any work, either covered or affected by the change.

**12. Claims.** The Contractor shall give written notice to the City of all claims other than change orders within thirty (30) days of the occurrence of events giving rise to the claim, but in no event later than the time of approval by the City for final payment. Any claim for damages, additional payment for any reason, or extension of time shall be conclusively deemed to have been waived by Contractor unless a timely written claim is made in strict accordance with the applicable provisions of this Contract. At a minimum, a Contractor's written claim must include the information required in Section 11.3 regarding protests.

FAILURE TO PROVIDE A COMPLETE, WRITTEN NOTIFICATION OF CLAIM IN THE TIME ALLOWED SHALL BE AN ABSOLUTE WAIVER OF ANY CLAIMS ARISING IN ANY WAY FROM THE FACTS OR EVENTS SURROUNDING THAT CLAIM.

The Contractor must, in any event, file any claim or bring any suit arising from or connected to this Contract within 120 calendar days from the date the work is completed. Contractor, upon making application for the final payment, shall be deemed to have waived its right to claim for any other damages for which application has not been made, unless such claim for final payment includes notice of additional claim and fully describes such claim.

**13. Contractor's Risk of Loss.** It is understood that the whole of the work under this Contract is to be done at the Contractor's risk, and that he/she has familiarized himself/herself with all existing conditions and other contingencies likely to affect the work, and has made his/her bid accordingly, and that Contractor shall assume the responsibility and risk of all loss or damage to materials or work which may arise from any cause whatsoever prior to completion.

## **14. Insurance.**

### **A. Insurance Term**

The Contractor shall procure and maintain insurance, as required in this Section, without interruption from commencement of the Contractor's work through the term of the contract and for thirty (30) days after the Physical Completion date, unless otherwise indicated herein.

### **B. No Limitation**

Contractor's maintenance of insurance, its scope of coverage and limits as required herein shall not be construed to limit the liability of the Contractor to the coverage provided by such insurance, or otherwise limit the City's recourse to any remedy available at law or in equity.

### **C. Minimum Scope of Insurance**

Contractors required insurance shall be of the types and coverage as stated below:

1. Automobile Liability insurance covering all owned, non-owned, hired and leased vehicles. Coverage shall be at least as broad as Insurance Services Office (ISO) form CA 00 01.
2. Commercial General Liability insurance shall be as least as broad as ISO occurrence form CG 00 01 and shall cover liability arising from premises, operations, independent contractors, products-completed operations, stop gap liability, personal injury and advertising injury, and liability assumed under an insured contract. The Commercial General Liability insurance shall be endorsed to provide a per project general aggregate limit using ISO form CG 25 03 05 09 or an equivalent endorsement. There shall be no exclusion for liability arising from explosion, collapse or underground property damage. The City shall be named as additional an insured under the Contractor's Commercial General Liability insurance policy with respect to the work performed for the City using ISO Additional Insured endorsement CG 20 10 10 01 and Additional Insured-Completed Operations endorsement CG 20 37 10 01 or substitute endorsements providing at least as broad coverage.
3. Workers' Compensation coverage as required by the Industrial Insurance laws of the State of Washington.

### **D. Minimum Amounts of Insurance**

Contractor shall maintain the following insurance limits:

1. Automobile Liability insurance with a minimum combined single limit for bodily injury and property damage of \$1,000,000 per accident.
2. Commercial General Liability insurance shall be written with limits no less than \$1,000,000 each occurrence, \$2,000,000 general aggregate and \$2,000,000 products-completed operations aggregate limit.

**E. City Full Availability of Contractor Limits**

If the Contractor maintains higher insurance limits than the minimums shown above, the City shall be insured for the full available limits of Commercial General and Excess or Umbrella liability maintained by the Contractor, irrespective of whether such limits maintained by the Contractor are greater than those required by this contract or whether any certificate of insurance furnished to the City evidences limits of liability lower than those maintained by the Contractor.

**F. Other Insurance Provision**

The Contractor's Automobile Liability and Commercial General Liability insurance policies are to contain, or be endorsed to contain that they shall be primary insurance as respect the City. Any insurance, self-insurance, or self-insured pool coverage maintained by the City shall be excess of the Contractor's insurance and shall not contribute with it.

**G. Acceptability of Insurers**

Insurance is to be placed with insurers with a current A.M. Best rating of not less than A: VII.

**H. Verification of Coverage**

Contractor shall furnish the City with original certificates and a copy of the amendatory endorsements, including but not necessarily limited to the additional insured endorsements, evidencing the insurance requirements of the Contractor before commencement of the work. Upon request by the City, the Contractor shall furnish certified copies of all required insurance policies, including endorsements, required in this contract and evidence of all subcontractors' coverage.

**I. Subcontractors' Insurance**

The Contractor shall cause each and every Subcontractor to provide insurance coverage that complies with all applicable requirements of the Contractor-provided insurance as set forth herein, except the Contractor shall have sole responsibility for determining the limits of coverage required to be obtained by Subcontractors. The Contractor shall ensure that the City is an additional insured on each and every Subcontractor's Commercial General liability insurance policy using an endorsement at least as broad as ISO Additional Insured endorsement CG 20 38 04 13.

**J. Notice of Cancellation**

The Contractor shall provide the City and all Additional Insureds for this work with written notice of any policy cancellation within two business days of their receipt of such notice.

**K. Failure to Maintain Insurance**

Failure on the part of the Contractor to maintain the insurance as required shall constitute a material breach of contract, upon which the City may, after giving five business days' notice to

the Contractor to correct the breach, immediately terminate the contract or, at its discretion, procure or renew such insurance and pay any and all premiums in connection therewith, with any sums so expended to be repaid to the City on demand, or at the sole discretion of the City, offset against funds due the Contractor from the City.

**15. Payment and Performance Bonds.** (City must check of the following boxes.) The City  waives, *if Declaration of Option for Performance Bond or Additional Retainage (10% in lieu of) is submitted*  does not waive the bond/surety provisions of this section pursuant to RCW 39.04.155(3). If the City waives these provisions then Contractor need not complete this section. If the City does not waive these provisions then Contractor shall provide the following: Payment and Performance bonds shall be received by the City in the amount of 100% of the Contract price and no less. The bonds must be accepted by the City prior to the execution of the Contract, and shall be in a form approved by the City. The bonds shall be released thirty (30) days after the date of final acceptance of the work performed under this Contract and receipt of all necessary releases from the Department of Revenue and Department of Labor and Industries in settlement of any liens filed under Chapter 60.28 RCW, whichever is later.

**16. Termination.** This Contract shall terminate upon satisfactory completion of the work described in the Scope of Work (Exhibit A) and final payment by the City. The City may terminate the Contract and take possession of the premises and all materials thereon and finish the work by whatever methods it may deem expedient, by giving ten (10) days' written notice to the Contractor.

In the event this Contract is terminated by the City, Contractor shall not be entitled to receive any further amounts due under this Contract until the work specified in the Scope of Work (Exhibit A) is satisfactorily completed, as scheduled, up to the date of termination. At such time, if the unpaid balance of the amount to be paid under the Contract exceeds the expense incurred by the City in finishing the work, and all damages sustained by the City or which may be sustained by the City or which may be sustained by the reason of such refusal, neglect, failure or discontinuance of employment, such excess shall be paid by the City to the Contractor. If the City's expense and damages exceed the unpaid balance, Contractor and his surety shall be jointly and severally liable therefore to the City and shall pay such difference to the City. Such expense and damages shall include all legal costs incurred by the City to protect the rights and interests of the City under the Contract, provided such legal costs shall be reasonable.

**17. Attorney's Fees and Costs.** If any legal proceeding is brought for the enforcement of this Contract, or because of a dispute, breach, default, or misrepresentation in connection with any of the provisions of this Contract, the prevailing party shall be entitled to recover from the other party, in addition to any other relief to which such party may be entitled, reasonable attorney's fees and other costs incurred in that action or proceeding.

**18. General Administration.** The Project Manager of the City shall have primary responsibility for the City under this Contract to oversee and approve all work performed as well as all financial invoices.

**19. Ownership of Documents.** On payment to the Contractor by the City of all compensation due under this Contract, all finished or unfinished documents and material prepared by the Contractor with funds paid by the City under this Contract shall become the property of the City and shall be forwarded to the City upon its request.



**20. Subletting or Assigning of Contracts.** Neither the City nor the Contractor shall assign, transfer, or encumber any rights, duties or interests accruing from this Contract without the prior written consent of the other. If subcontract work is needed, prior to approval by the City, the Contractor must verify that its first tier subcontractors meet the bidder responsibility criteria as written in Chapter 39.04.350 RCW.

**21. Relationship of Parties.** The parties intend that an independent contractor - client relationship will be created by this Contract. As Contractor is customarily engaged in an independently established trade which encompasses the specific service provided to the City hereunder, no agent, employee, representative or subcontractor of Contractor shall be or shall be deemed to be the employee, agent, representative or subcontractor of the City. None of the benefits provided by the City to its employees, including, but not limited to, compensation, insurance and unemployment insurance, are available from the City to the Contractor or his employees, agents, representatives or subcontractors. Contractor will be solely and entirely responsible for his acts and for the acts of Contractor's agents, employees, representatives and subcontractors during the performance of this Contract. The City may, during the term of this Contract, engage other independent contractors to perform the same or similar work that Contractor performs hereunder

**22. Nonwaiver of Breach.** The failure of the City to insist upon strict performance of any of the terms and rights contained in this Contract, or to exercise any option contained in this Contract in one or more instances, shall not be construed to be a waiver or relinquishment of those terms and rights and such terms and rights shall remain in full force and effect.

**23. Written Notice.** All communications regarding this Contract shall be sent to the Parties at the addresses listed below in the Contact information, unless otherwise notified. Any written notice shall become effective on delivery, but in any event on the date three (3) calendar days after the date of mailing by registered or certified mail, and shall be deemed sufficiently given if sent to the addressee at the address stated in this Contract.

**24. Discrimination.** The Contractor agrees not to discriminate against any employee or applicant for employment or any other person in the performance of this Agreement because of race, creed, color, national origin, marital status, sex, sexual orientation, age, disability, or other circumstance prohibited by federal, state or local law or ordinance, except for a bona fide occupational qualification.

**25. Term.** This Contract shall be effective from the date of Contract execution through expiration of the warranty period as described in Section 9. Provisions requiring indemnification and insurance shall survive the term of the Contract.

**26. Immigration Reform and Control Act.** The contractor represents and warrants that it is in compliance with and agrees that it will remain in compliance with the provisions of the Immigration Reform and Control Act of 1986, including but not limited to the provisions of the Act prohibiting the hiring and continued employment of unauthorized aliens and requiring verification and record keeping with respect to the status of each of its employees' eligibility for employment. The contractor shall include a provision substantially the same as this section in any and all contracts with subcontractors performing work required of the contractor under this contract. The contractor agrees to indemnify and hold the City harmless from any and all

liability, including liability for interest and penalties, the City may incur as a result of the contractor failing to comply with any provisions of the Immigration Reform and Control Act of 1986.

**IN WITNESS WHEREOF**, the Parties have executed this Contract as of the day and year above written.

**CITY OF BONNEY LAKE:**

**CONTRACTOR:**

[ \_\_\_\_\_ ]

Signature: \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Print Name: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_

Taxpayer ID #: \_\_\_\_\_

**CITY CONTACT:**

Print Name: Doug Budzynski

City of Bonney Lake

9002 Main Street E

Bonney Lake, WA 98391

Phone: (253) 447-4342

**CONTRACTOR CONTACT:**

Print Name: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Phone : \_\_\_\_\_

Fax: \_\_\_\_\_

Contractor License #: \_\_\_\_\_

(if this is a new contractor or if Contractor has never conducted work with the City, a W-9 form must be attached to this agreement)



Project Name: Lift Station 7 - SCADA Upgrade

**Declaration of Option for Performance Bond or Additional Retainage  
(Contracts Under \$150,000 only)**

Note: This form must be submitted at the time the Contractor executes the Contract. The Contractor shall designate the option desired by checking the appropriate space.

The Contractor elects to:

\_\_\_\_\_ (1) Furnish a performance bond in the amount of the total contract sum. An executed performance bond on the required form is included with the executed contract documents. Mandatory on contracts exceeding \$150,000.

\_\_\_\_\_ (2) Have the City, on contracts of one hundred fifty thousand dollars or less, at the option of the contractor the respective public entity may, in lieu of the bond, retain Ten percent (10%) of the total contract amount, for a period of thirty (30) days after final acceptance or until receipt of all necessary releases from the department of revenue and the department of labor and industries and settlement of any liens filed under Chapter 60.28 RCW, whichever is later.

In choosing option 2 (RCW 39.08) , the Contractor agrees that if the Contractor, its heirs, executors, administrators, successors, or assigns, shall in all things stand to and abide by, and well and truly keep and perform the covenants, conditions and agreements in the Contract, and shall faithfully perform all the provisions of such contract and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions and agreements of any and all duly authorized modifications of the Contract that may hereafter be made, at the time and in the manner therein specified, and shall pay all laborers, mechanics, subcontractors, and materialmen, and all persons who shall supply such person or persons, or subcontractors, with provisions and supplies for the carrying on of such work, on his or her part, and shall indemnify and save harmless the City of Bonney Lake, Washington, its officers and agents from any claim for such payment, then the funds retained in lieu of a performance bond shall be released at the time provided in said option 2; otherwise, the funds shall be retained until the Contractor fulfills the said obligations.

\_\_\_\_\_  
Contractor Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
City of Bonney Lake

\_\_\_\_\_  
Date

### Certification of Compliance with Wage Payment Statutes

The bidder hereby certifies that, within the three-year period immediately preceding the bid solicitation date **April 13, 2021** that the bidder is not a “willful” violator, as defined in RCW 49.48.082, of any provision of chapters 49.46, 49.48, or 49.52 RCW, as determined by a final and binding citation and notice of assessment issued by the Department of Labor and Industries or through a civil judgment entered by a court of limited or general jurisdiction.

I certify under penalty of perjury under the laws of the State of Washington that the foregoing is true and correct.

\_\_\_\_\_  
Contractor

\_\_\_\_\_  
Signature of Authorized Official\*

\_\_\_\_\_  
Printed Name

\_\_\_\_\_  
Title

\_\_\_\_\_  
Date                      City                      State

Check one:

Individual       Partnership       Joint Venture       Corporation

State of Incorporation, or if not a corporation, State where business entity was formed:

\_\_\_\_\_

If a Co-partnership, give firm name under which business is transacted:

\_\_\_\_\_

\* If a corporation, proposal must be executed in the corporate name by the president or vice-president (or any other corporate officer accompanied by evidence of authority to sign). If a co-partnership, proposal must be executed by a partner.

**CITY OF BONNEY LAKE  
PUBLIC WORKS DEPARTMENT  
19306 BONNEY LAKE BOULEVARD  
P.O. BOX 7380  
BONNEY LAKE, WA 98391  
Ph: 253.862.8602**

## **WARRANTY AND DEFECT BOND**

NAME OF PROJECT: \_\_\_\_\_ BOND NO. \_\_\_\_\_

LOCATION/ADDRESS \_\_\_\_\_

PROJECT NO.: \_\_\_\_\_

WE, \_\_\_\_\_, as Principal, and \_\_\_\_\_, a corporation organized and existing under and by virtue of the laws of the State of \_\_\_\_\_, Legally doing business in the State of Washington, as Surety, are held and firmly bound unto the City of Bonney Lake, Pierce County, Washington, as Obligee, in the penal sum of \_\_\_\_\_ Dollars (\$ \_\_\_\_\_), for the payment of which we firmly bind ourselves, our legal representatives, successors and assigns, jointly and severally.

WHEREAS, the Principal has completed the project known as \_\_\_\_\_, located in the City of Bonney Lake, Pierce County, Washington, and the Principal has constructed certain improvements in connection with said Project and intends to secure the successful operation of said improvements pursuant to the Project Contract

NOW, THEREFORE, THE CONDITIONS OF THIS OBLIGATION are such that if the improvements constructed by the Principal shall successfully operate for a period of one year from the satisfactory completion of the facility or Final plat approval, whichever is later, and shall remain free of defect in workmanship and materials for the period, then this obligation shall be null and void, otherwise to remain in full force and effect.

IT IS FURTHER EXPRESSLY PROVIDED THAT:

1. Until written release of this obligation by the Obligee, this bond may not be terminated or cancelled by the Principal or Surety for any reason.
2. Damage from expected usage and damage due to construction activities shall be considered "defects" for purposes of this bond.
3. In the event of any failure of the improvements to satisfactorily perform or in the event of a defect in the workmanship or materials, the Principal or Surety shall make prompt and adequate repair to correct the failure or defect. In the event these repairs are not made within 45 days of notice by either the Principal or Surety, the Surety shall, upon demand, tender the total bond amount to the Obligee. After making the repairs, the Obligee will return any unexpected funds, without interest, to the Surety.
4. In the event the Obligee determines that repairs must be performed immediately to prevent risk to person and property, the Obligee may make the repairs and the cost of those repairs shall be paid by the Principal or Surety.
5. The Principal shall be obligated to make the repairs described above, which obligation shall not be limited by the amount of this bond.

**CITY OF BONNEY LAKE WARRANTY AND DEFECT BOND**

This Bond is issued pursuant to chapter 39.08 RCW and shall be interpreted in compliance with said chapter.

<b>PRINCIPAL</b>	_____	<b>SURETY</b>	_____
<b>By:</b>	_____	<b>By:</b>	_____
<b>Printed Name</b>	_____	<b>Printed Name</b>	_____
<b>Date:</b>	_____	<b>Date:</b>	_____
<b>Mailing Address:</b>	_____ _____ _____	<b>Mailing Address:</b>	_____ _____ _____
<b>Phone No.</b>	_____	<b>Phone No.</b>	_____

STATE OF WASHINGTON )  
  ) SS  
COUNTY OF PIERCE     )

I certify that I know or have seen satisfactory that \_\_\_\_\_ signed this instrument and acknowledged it to be his/her free and voluntary act for the uses and purposes mentioned in the instrument.

WITNESS WHEREOF, I have hereunto set my hand and official seal the day and year first above written.

\_\_\_\_\_  
Printed Name: \_\_\_\_\_  
NOTARY PUBLIC in and for the State of Washington,  
Residing at: \_\_\_\_\_  
My commission expires: \_\_\_\_\_

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**DIVISION 1**  
**GENERAL**

# Division 1

## General

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### 1.10 GENERAL

Sections in these specifications titled “*Common Work for . . .*” shall apply to all following subsections whether directly referenced or not.

Sections in these specifications titled “*Related Sections*” shall be read as integral to the specification as if they were fully detailed within. All work and materials described in such sections shall be provided and performed by the Contractor.

#### 1.11.00 Summary of Work

The Lift Station 7 SCADA Upgrade project consists of the fabrication of one sewer lift station telemetry panel and replacement of an existing telemetry panel at one sewer lift station.

#### 1.11.02 Reuse of Documents

Contractor and any Subcontractor or Supplier shall not:

1. Have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions; or
2. Reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer.
3. The prohibitions of this Paragraph will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

#### 1.11.03 Electronic Data

1. Unless otherwise stated in the Supplementary Conditions, the data furnished by Owner to Contractor, or by Contractor to Owner, that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user’s sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.
2. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data’s creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 30 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 30-day acceptance period will be corrected by the transferring party.
3. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data’s creator.

4. Computer Aided Design (CAD) files will not be made available to the Contractor. This includes AutoCAD™, Civil3D™, or other similar file types. Only printed hard copies or electronic representations of hard copies (e.g. PDF) will be provided.

### **1.13 Permits and Licenses**

The Contractor shall acquire and pay for all necessary permits which may include:

- Electrical Permit

## **1.20 PRICE AND PAYMENT PROCEDURES**

### **1.21.29 Quantity Allowances**

If more or fewer materials are needed when the construction quantity is within plus or minus 25 percent of the bid quantity, costs for restocking of unused materials, or handling and delivery costs on additional materials shall be incidental to the bid price and no additional payment will be made.

### **1.21.55 Cost Increases for Materials**

There will be no allowance for additional payment should the cost of any materials go up during the original contract timeframe, or during any approved contract time extensions. The Contractor is responsible for securing prices at the time of bid.

### **1.25.00 Substitution Procedures**

Any product or construction method that does not meet these specifications will be considered a substitution. Substitutions must be approved prior to their installation or use on this project.

No guarantee is made that product model numbers included in the specifications or on the plans are current at the time of bidding. The bidder shall provide pricing in their proposal for current versions of discontinued models. If the bidder is uncertain of the correct replacement model, or feels there is a price discrepancy, the bidder shall request a substitution following the requirements of section 1.25.13.10 Substitutions Prior to Bid Opening. Requests for price increases after award will not be accepted.

#### **1.25.13.10 Substitutions Prior to Bid Opening**

Before opening bids, the Owner may consider written requests from product suppliers or prime bidders for substitutions. All requests for substitution must be received by Owner a minimum of 7 working days prior to bid opening. Requests shall be accompanied by drawings and specifications in sufficient detail to allow the Owner to determine whether or not the substitute proposed is equal to that specified. All requests shall include a listing of any significant variations in material or methods from those specified. If there are no variations, a statement to that fact shall be included in the request for approval. The determination as to whether or not a proposed substitute is acceptable shall rest solely with the Owner. Approval of substitutions will be only by addendum. The bidder shall include, in the proposal, all costs for any modifications required to adopt the substitute.

### **1.25.13.15 Substitutions After Contract Execution**

Within 30 calendar days after the date of the contract, the Owner shall consider formal requests from the Contractor for a substitution of products in place of those specified. Submit two copies of each request for a substitution. Data shall include the necessary change in construction methods, including a detailed description of the proposed method and related drawings illustrating the methods. An itemized comparison of each proposed substitution with product or method specified shall be provided.

In making a request for a substitution, the Contractor represents that they have investigated the proposed product or method and has determined that it is equal or superior to the product specified. The Contractor shall coordinate the installation of accepted substitutions into the work, making changes that may be required for the work to be completed. The Contractor waives all claims for additional costs related to substitutions.

## **1.30 ADMINISTRATIVE**

### **1.31 Project Management and Coordination**

#### **1.31.01 Contractor's Responsibility**

The work included in this contract is shown on the contract plans and described in these project specifications. All work incidental and necessary to the completion of the work described and shown shall be performed by the Contractor. In submitting a bid for this project, the Bidder warrants that they are an expert in this and related work, that they understand the process and functions shown, and that various work and processes not shown but necessary for the successful operation of this project will be provided by the Contractor.

The General (or Prime) Contractor is fully responsible for providing the subcontractors and suppliers with all relevant portions of the plans and specifications necessary to bid and construct the improvements.

Damage to existing utilities or property shall be repaired or replaced by the Contractor at the discretion of the Owner.

The Contractor and each of the Subcontractors are responsible for coordinating the required inspections. There are specific requirements for inspection responsibilities and the advance notice that must be given to minimize construction delays. It is the Contractor's responsibility to be familiar with these requirements, include the coordination necessary in this estimate of project costs and schedule, and to comply with the requirements during construction. Failure to follow proper inspection and notification procedures may result in on-site work stoppages and removal or demolition of unapproved structures or systems, all at the Contractor's expense. See Starting and Adjusting section for details.

Do not start work on this project or on any public or private right-of-way or easement until clearance is given by the Owner. It will be the responsibility of the Contractor to comply with the requirements of any permit for the project. Do not hinder private property access without a 24-hour notice to the private property owner, and do not hinder access for more than an 8-hour period. Do not disrupt emergency aid access to private property.

The Contractor is solely responsible for all elements of site safety. Inspections performed by the Owner are only to monitor and record that project plans and specifications are being complied with and construction is consistent with the design intent.

The Contractor shall be responsible for managing, coordinating, and overseeing his subcontractors, suppliers, manufacturers' representatives, or any other persons performing Work. The Contractor shall have a competent representative, familiar with the project and work being performed, on-site at all times.

### **1.31.10 COVID-19 Scheduling Provisions**

Exclusion from Force Majeure. A force majeure event does not include the COVID-19 Pandemic. See Section 2, below, for information on how Contractor shall notify the Owner if Contractor desires to claim additional Time due to events attributable to the COVID-19 Pandemic.

Waiver. Contractor shall provide notice to the Owner of any delay attributable to the COVID-19 Pandemic in the manner specified in Section 2. Failure to provide notice to the Owner with regard to delays attributable to the COVID-19 Pandemic as required by Section 2 constitutes a waiver of Contractor's right to later make such a request.

Adjustment of Time for COVID-19.

1. Definitions.
  - a. "COVID-19" means the novel coronavirus respiratory disease.
  - b. "COVID-19 Pandemic" means the pandemic declared by the World Health Organization on March 11, 2020.
  - c. "Executive Order" means any order signed by a governor restricting or prohibiting certain activities of businesses, schools, and individuals to mitigate the spread of COVID-19.
  - d. "Labor shortage" means a shortage of Contractor's qualified personnel because they are on leave due to COVID-19.
  - e. "Governmental health regulation" means any state or local health regulation aimed to mitigate the spread of COVID-19, including the social distancing regulation.
  - f. "Supply chain disruption" means the Contractor's inability to obtain goods used to perform the Work contemplated under the Contract due to COVID-19.
  - g. "Time" means any term used to define the duration the Agreement is in effect, including, but not limited to "Term" or "Contract Time."
2. Contractor's Request Required. In the event the Contractor believes that additional Time is required due to the COVID-19 Pandemic due to delays resulting from a labor shortage, a supply chain disruption, or mandated compliance with Executive Orders or governmental health regulations, the Contractor shall submit to the Owner a timely request for adjustment of Time. A request is presumed to be timely if it occurs within seven calendar days after the Contractor becomes aware of any delay caused by a

- reason stated in this Section. The Owner will only consider requests for adjustment of Time if the Contractor's request provides the following information:
- a. The date the delay began as a result of the COVID-19 Pandemic.
  - b. The cause of the delay. The Contractor must identify in the request whether the delay is due to a labor shortage, a supply chain disruption, or compliance with an Executive Order or governmental health regulation and the specific circumstances surrounding the delay.
  - c. The specific actions and efforts the Contractor is doing to limit the impact of the delay.
  - d. The date Contractor expects the delay will end, if known. If not known, Contractor shall promptly notify the Owner within seven calendar days after the delay ends.
  - e. The Owner shall be entitled to request from the Contractor all documentation necessary to evaluate Contractor's request for more Time under this Section.
3. Basis for Adjustment of Time. The Owner will consider causes that include delays that affect the Contractor's performance of Work directly attributable to the COVID-19 Pandemic such as an Executive Order, a governmental health regulation, a labor shortage, or a supply chain disruption that could not be mitigated by the Contractor's specific actions and efforts, or by the reasonable actions and efforts the Contractor should have taken, to minimize the delay.
4. Consideration and Response by Owner. The Owner will only consider a Contractor's request for additional Time if Contractor supplied all the required information described in Section 3(b). The Owner will review a properly submitted request for Time adjustment related to COVID-19, and within a reasonable time, will advise the Contractor of the Owner's findings. If the findings determine that Contractor is entitled to additional Time, then Owner and Contractor shall execute a written change order extending the Time equal to the length of the actual delay in performance.

Termination. In addition to the termination rights in the Agreement, the Agreement may be terminated by either party by giving notice as required in the Agreement if: 1) federal or state laws, regulations, or guidelines are modified or interpreted in a way that the Work under the Agreement is prohibited; 2) recommendations, declarations or orders by state or local governments, including local health authorities and local officials, discourage or prohibit the event or scope of work that was to be performed under the Agreement; or 3) Owner is prohibited from paying for the work from the planned funding source.

### **1.31.11 COVID-19 Health and Safety Plan**

The Contractor shall prepare a project specific COVID-19 health and safety plan (CHSP) prior to beginning physical Work.

The Contractor shall update and resubmit the CHSP as the work progresses and new activities appear on the look ahead schedule. If the conditions change on the project, or a particular activity, the Contractor shall update and resubmit the CHSP. Work on any activity shall cease if conditions prevent full compliance with the CHSP.



The CHSP shall address the health and safety of all people associated with the project including State workers in the field, Contractor personnel, consultants, project staff, subcontractors, suppliers and anyone on the project site, staging areas, or yards. The plan shall contain the following minimum elements:

1. The CHSP shall identify all standards, guidance, publications, and sources on which it is based. Those standards may include references to OSHA, WISHA, and CDC publications that are current at the time the CHSP is prepared.
2. The CHSP shall identify a responsible individual from the Contractor who is responsible for implementation of the CHSP. The individual(s) contact information shall be listed in the CHSP.
3. The CHSP shall specifically identify the project for which it is applicable, and if applicable, shall address project work areas outside the project limits such as staging areas or yards.
4. The CHSP shall identify the PPE and administrative and engineered controls necessary to maintain a safe site. This includes but is not limited to: sanitation resources, screening stations, safety briefings, controlling access, and personal protective equipment (PPE) needed to protect workers from COVID-19.
5. The CHSP shall identify measures for screening and managing workers or visitors to areas identified in the CHSP. The plan shall include procedures should a person exhibit symptoms of COVID-19.
6. The CHSP shall identify how the plan will be updated as new work activities are added with each two-week look-ahead schedule. The CHSP updates shall identify the number of workers, crews, work tasks, and the degree of congestion or confinement workers will experience for the work activities in the two-week look-ahead schedule.
7. The CHSP shall include how the Contractor will ensure everyone on the site has been trained on the CHSP requirements. This includes subcontractors, suppliers, and anyone on the project site.

The Contractor shall grant full and unrestricted access to the Engineer for CHSP Inspections. The Engineer (or designee) may conduct periodic compliance inspections on the project site, staging areas, or yards to verify that any ongoing work activity is following the CHSP plan. If the Engineer becomes aware of a noncompliance incident either through a site inspection or other means, the Contractor will be notified immediately (within 1 hour). The Contractor shall immediately remedy the noncompliance incident or suspend all or part of the associated work activity. The Contractor shall satisfy the Engineer that the noncompliance incident has been corrected before the suspension will end.

### **1.32.16 Construction Progress Schedule**

Contractor is responsible for providing an up to date construction schedule with each monthly pay estimate and at other times as requested by the Owner or as required by progress of the work. If the current schedule is still in-line with the previous schedule, the Contractor shall inform the Owner with each pay estimate. Non-working day requests shall also be submitted by the Contractor with each monthly pay estimate. Owner may delay monthly progress payments if Contractor fails to submit updated schedule and non-working day requests.

## 1.32.29 Periodic Work Observation

The Owner may elect to have an inspector on site to monitor, observe and record construction progress. The Contractor maintains complete responsibility to verify construction is meeting the design intent and is being constructed in accordance with the plans and specifications. It is not the responsibility of the Owner's inspector to address neither means and methods issues on site nor direct safety issues on site. The Owner's inspector does not have the authority to stop work if unsafe conditions are observed.

## 1.33 Submittals

### 1.33.23 Shop Drawings, Product Data, and Samples

Submittals are required for all items installed on this contract. Submittals shall be addressed to:

RH2 Engineering, Inc.  
22722 29th Dr. SE, Suite 210  
Bothell, WA 98021

Attn: Chris Roberts, P.E.

Email: [croberts@rh2.com](mailto:croberts@rh2.com)

Submittals may be provided in electronic format (preferred) or hard copy. Owner reserves the right to require the Contractor to provide hard-copy submittals at no additional cost to the Owner. Where hard-copy submittals are provided, Contractor shall submit three (3) copies; one set will be returned to the Contractor after review.

Electronic submittal via email is acceptable, however the Contractor shall follow up with the Owner to verify that the submittal was received. The Owner assumes no responsibility for emails that do not make it to the recipient. In the case of electronic submittals, only one copy will be returned to the Contractor, either electronically or hard copy at the Owner's discretion.

Submittal data for each item shall contain sufficient information on each item to determine if it is in compliance with the contract requirements. Submittal cutsheets and datasheets shall be annotated by the Contractor and shall clearly indicate the equipment and materials that will be provided, including any options or additive items. No generic cutsheets or datasheets will be accepted.

Items that are installed in the work that have not been approved through the submittal process shall be removed and an approved product shall be furnished, all at the Contractor's expense.

Shop drawing review will be limited to general design requirements only, and shall not relieve the Contractor from responsibility for errors or omissions, or responsibility for consequences due to deviations from the contract documents. No changes may be made in any submittal after it has been reviewed except with written notice and approval from the Owner.

Shop drawings shall be submitted on 8½-inch by 11-inch, 11-inch by 17-inch, or 22-inch by 34-inch sheets and shall contain the following information:

- Project Name as it appears on the Document Cover.
- Prime Contractor and Applicable Subcontractor.

- RH2 Engineering.
- Owner's Name (City of Bonney Lake).
- Applicable Specification and Drawings Reference.
- A stamp or statement that the Contractor has checked the equipment for conformance with the contract requirements, coordination with other work on the job, and dimensional suitability.
- A place for the Engineer to respond.

Submittals that do not comply with these requirements may be returned to the Contractor for re-submittal. The Contractor shall revise and resubmit as necessary. Acceptable submittals will be reviewed as promptly as possible and transmitted to the Contractor not later than 20 working days after receipt by the Engineer. Delays caused by the need for re-submittal shall not be a basis for an extension of contract time or delay damages.

Shop drawings and submittals shall contain the following information:

1. Shop or equipment drawings, dimensions, and weights.
2. Catalog information.
3. Model number, including descriptions for option and accessory codes.
4. Manufacturer's specifications.
5. Special handling instructions.
6. Maintenance requirements.
7. Wiring and control diagrams.
8. List of contract exceptions.

For integrated or package systems (see also 1.61.31), the components, shop drawings, instructions, and other elements may be submitted and reviewed individually. But the initial submittal must include the complete proposed system, and the final submittal must also be for the complete system clearly indicating all changes made during the submittal process.

By approving and submitting shop drawings and samples, the Contractor warrants that they have determined and verified all field measurements, field construction criteria, materials, catalog numbers, and similar data, and have checked and coordinated each shop drawing with the requirements of the work and of the contract documents.

The Owner will pay the costs and provide review services for a first and second review of each submittal item. Additional reviews shall be paid by Contractor by withholding the appropriate amounts from each payment estimate.

The Contractor is responsible for identifying the shop drawings and submittals required for this project. Specific submittal requirements are listed in each section of these specifications. Contractor shall keep a complete and up to date copy of all submittals and review responses at the job site readily available to the Owner for inspection.

## 1.40 QUALITY REQUIREMENTS

### 1.42.19 Reference Standards

Work under this contract shall be performed in accordance with applicable sections of the current Standard Specifications for Road, Bridge and Municipal Construction, Washington, American Public Works Association, and Washington State Department of Transportation, hereafter referred to as the Standard Specifications.

Certain other referenced standards used in this specification are from the latest editions of:

- IBC International Building Code
- UPC Uniform Plumbing Code
- IMC International Mechanical Code
- IFC International Fire Code
- NEC National Electrical Code
- AWWA American Water Works Association
- ANSI American National Standards Institute
- ASA American Standards Association
- ASTM American Society for Testing and Materials
- WSEC Washington State Energy Code

### 1.43.20 Warranty

The Contractor shall warrant all work and products for a period of one (1) year following project acceptance except for those components and listed warrantees below. The date of project acceptance is defined as the date the final payment is sent to the Contractor from the Owner.

Warranty does not cover damage due to misuse by the Owner or conditions outside of the Owner or Contractor's control or exceptional events (force majeure) including war, strikes, floods (water exceeding normal high water mark), rainfall in excess of 100 year storm event, fire, earthquakes, high winds (over 85 mph for 3 seconds peak gust), freezes below 10 degrees Fahrenheit (Western Washington), freezes below minus 10 degrees Fahrenheit (Eastern Washington), governmental restrictions, vandalism, and power failures or surges. The Contractor has control over workmanship, third party subcontractors and parts and materials used to complete the project.

Warranties in addition to this warranty are listed in the following sections:

- Division 17.05 and 17.90.1 Telemetry systems

### 1.45.16 Field Quality Control Procedures

Unless otherwise noted on the plans or within these specifications, 48-hour prior notice shall be given to the Owner and appropriate reviewing agency for all inspections required for the

construction of the project. Forty-eight-hour notice is defined as two complete working day notice. Time is not counted on weekends and holidays (inspections required on a Monday or the day after a holiday shall be scheduled a minimum of 48 hours in advance not including the holiday hours or weekend hours.)

## **1.50 TEMPORARY FACILITIES AND CONTROLS**

### **1.51 Temporary Utilities**

The Contractor is responsible for providing all necessary water for construction-related fire protection and utilities required by this contract, or by laws and regulations. Sanitary facilities adequate for all workers shall comply with all codes and regulations.

Temporary electrical power is available at the site. The Contractor may use existing receptacles, when available, at the existing facility for powering tools and equipment.

The Contractor shall make all arrangements for the required construction power. Power is available at some locations on the construction site. The Contractor is responsible for reviewing what is available and providing what is required.

#### **1.52.00 Construction Facilities**

The Contractor is responsible for construction and location of all field offices, all necessary gates and barricades, fences, handrails, guard rails, and securities required by this contract, or by laws and regulations. There shall be shelters and dry facilities for the workers as required. The Contractor shall provide all guards, marks, shields, protective clothing, rain gear, and other equipment required by law, ordinance, labor contracts, Occupational Safety and Health Administration (OSHA) regulations, and other regulations for the maintenance of health and safety. First aid kits and equipment as required by law shall also be supplied.

##### **1.52.20 Locks and Keys**

If the Owner provides a key to the Contractor for existing Owner locks, the Contractor will be responsible for the key until returning it to the Owner. If the Contractor loses the key, the Contractor will pay for re-coring of all Owner locks that use that key.

### **1.54 Construction Aids**

The Contractor or product manufacturer may include work, materials, or components to aid in shipping, storage, installation, or other work for their convenience. Such items shall be removed prior to final project acceptance if they may interfere with the operation or maintenance of permanent work. Some examples include, but are not limited to:

- Lifting eyes (remove only if a safety concern or obstruction)
- Picking holes (plug)
- Intermediate or shipping bracing (remove)
- Protective shipping adhesives, coatings or covers (remove and clean residue)

## **1.60 PRODUCT REQUIREMENTS**

### **1.61 Common Product Requirements**

#### **1.61.31 Integrated (or Package) Products**

Products specified as integrated or packaged must be administered with a single point of responsibility from a producer who regularly furnishes such products and is qualified to address and resolve issues during submittals, fabrication, installation, commissioning, and operation. These responsibilities will not be transferred to any other party without written approval by the Engineer. Products that fall under this category include but are not limited to the following (when specified as packaged or integrated).

- Pump stations
- Valve stations
- Treatment systems
- HVAC systems
- Conveying systems
- Control systems

## **1.70 EXECUTION AND CLOSEOUT REQUIREMENTS**

### **1.74 Cleaning and Waste Management**

#### **1.74.13 Progress Cleaning**

All areas impacted by the work shall be restored to at least original condition, unless specifically identified otherwise in the plans or specifications. All costs are incidental.

If an area of the project will be left idle, or minimal work performed for more than two weeks, the Contractor shall clean up the area prior to moving. In this context, clean-up means: stockpiles and materials shall be removed so as not to be obstructions or hazards; surfaces graded smooth as to their purpose; traffic control systems removed, and traffic restored to the satisfaction of the local road agency.

#### **1.74.23 Final Cleaning**

Clean up debris and unused material, and remove from the site and any buildings. If vehicle traffic causes ruts, repair asphalt (new or existing) in paved areas, in other areas back track with dozer or excavator and repair to proposed surface condition including necessary hydroseed, mulch, and landscaping. Eliminate weeds within the construction area prior to project closeout.

Buildings shall be broom clean and all foreign damage or markings removed or repaired.

Equipment shall be washed clean using appropriate methods.

Unpainted exposed concrete structures shall be cleaned to a consistent bare concrete surface finish. Remove extraneous substances such as efflorescence, leakage residue, and excess repair materials.

Remove existing equipment or materials identified in the contract documents or that interfere with the work. Dispose of all such existing equipment or materials unless the Owner requests items to be salvaged for their use. Owner has first right of salvage.

Should the Owner identify salvageable items of their property prior to removal, the Contractor shall protect said items from damage during the work, and will be responsible for reimbursing the Owner should the Contractor damage the items.

## **1.75 Starting and Adjusting**

### **1.75.16 Startup Procedures**

#### **1.75.16.10 Startup**

See the Automatic Control section for control system startup.

Startup shall consist of a simulated operation of all equipment and controls. The purpose of startup shall be to check that all equipment will function under operating conditions, that all interlocking controls and sequences are properly set, and that the facility will function as an operating unit.

Technically qualified factory representatives shall be present for the startup phase. All Representatives shall be trained, qualified, and have experience in troubleshooting and fixing field issues. The startup shall continue until it is demonstrated that all functions, controls, and machinery are functioning correctly.

Authorized manufacturer's representatives shall be provided for the following items:

- Automatic Control Equipment
- Radio and Antenna Equipment

#### **1.75.16.12 Startup and Testing Coordination**

The Contractor shall conduct all testing and startup. Testing and startup shall not be a cause for claims for delay by the Contractor and all expenses for testing and startup shall be incidental to this contract.

The placing of all improvements in service shall consist of three parts: "testing", "startup", and "operation". Not less than 21 calendar days before the anticipated time for beginning testing, the Contractor shall notify and submit to the Owner for approval, a complete plan for the following:

1. Schedules for tests:
  - A. Factory Demonstration Test (at panel shop)
  - B. Control system
2. Detail schedule of procedures for startup.

3. Complete schedule of events to be accomplished during testing.
4. An outline of work remaining under the contract that will be carried out concurrently with the operation phases.

Failure to provide proper notification to the Owner may lead to liquidated damages if schedule cannot be maintained. If rescheduling is required because components are not ready for testing the notification requirements are reset and shall provide for 21 calendar days advance notice in order to reserve Engineer's and/or Owner Representatives' time.

The Contractor shall make arrangements for all materials, supplies, and labor necessary to efficiently complete the testing, startup, and operation. Measuring devices must be functional, accurate, legible, and scaled appropriately for the test. The Owner has the right to reject or require verification for any measuring device the Owner suspects in its accuracy.

At a minimum, the Contractor shall provide:

- Voltmeter
- Amp meter

### **1.75.16.20 Testing**

The Contractor may periodically request preliminary testing for items that must be covered or tested before other work can proceed. In these cases, the work shall not be tested or covered up without timely notice to the Owner of its readiness for testing. Should any work be covered up without notice, approval, or consent, it must, if required by the Owner, be uncovered for examination at the Contractor's expense. Where work is to be tested, all necessary equipment shall be set up and the work given a preliminary test so that any and all defects may be discovered and repaired prior to calling out the Owner for the test.

Final testing shall consist of individual tests and checks made on equipment intended to provide proof of performance of unit and proper operation of unit control together with necessary tests to show system operation in the presence of the Owner. Assure proper alignment, size, condition, capability, strength, proper adjustment, lubrication, pressure, hydraulic test, leakage test, and all other tests deemed necessary by the Owner to determine that all materials and equipment are of specified quality, properly situated, anchored, and in all respects, ready for use. Any certificates required by these specifications by the manufacturer's representatives shall be supplied to the Owner prior to startup.

All piping shall be tested as required by specifications and applicable codes. Tests on individual items of equipment, such as pipelines, structures, controls, and other items shall be as necessary to show proper system operation. During testing, the Contractor shall correct any defective work discovered. Startup shall not begin until all tests required by these specifications have been completed and approved by the Owner.

Not less than five working days before the anticipated time for beginning the testing, the Contractor shall provide a list of representatives that will be attending the testing. The Owner may request additional representatives at no additional cost if said representatives are identified in these specifications.

Qualified product representatives to be on site for the following equipment, at a minimum:



- Automatic Control Equipment
- Radio and Antenna Equipment

Additional representatives required may be identified elsewhere in these specifications.

### **1.75.16.22 Scheduling of Owner Review for Testing**

See Division 1.75.16.10 for scheduling and notification requirements.

In addition, the Contractor shall provide further notification two working days and two working hours (to confirm schedule) of the scheduled test to the Owner confirming that the Contractor has successfully completed all preliminary testing and that all equipment, tools, materials, labor, subcontractors, manufacturer's representatives, and all other items required for witnessed testing are available and fully functional. Failure to provide advance notification and confirmation, or meet any of the testing requirements shall constitute a failed test in accordance with the section Inspection and Tests of the General Conditions.

A detailed testing schedule shall be provided by the Contractor and updated as needed to be at least 48 hours ahead of actual testing at the project site. If testing requires downtime in order to perform repairs due to failed test, the Contractor shall pay the Owner in the amount of \$200 per hour per Owner Representative on site (minimum of \$400 per scheduled visit) for downtime lasting longer than 1 hour required to complete repairs to verify the complete construction is ready for startup and operation. This amount will be deducted from the appropriate bid item that relates to the finished construction and documented by the Owner at their discretion. The Contractor is required to have all systems pre-tested to their satisfaction prior to calling the Owner for formal testing.

**Schedule shall include system testing starting on Mondays or Tuesdays so that the remainder of the week can be used to identify the stability of the SCADA system. Testing shall not start on a Thursday, Friday or the day before an Owner identified holiday.**

### **1.75.16.40 Electrical and Control Systems Testing**

See also the applicable electrical sections for electrical system testing.

See also the applicable automation sections for automatic control system testing.

The following is a list of components that shall be tested prior to project completion. This list is intended as a general guide and is not necessarily complete:

- Radio communication system
- Control panel hardware
- Telemetry panels both in factory and in field
- All wiring and cable connections between equipment
- Local pump control
- Automatic control
- Instrumentation, devices, and alarms

## 1.78 Closeout Submittals

### 1.78.23 Operation and Maintenance Data

Failure to provide acceptable final documentation including O&M manuals and as-built drawings will result in non-payment of the appropriate bid item in the schedule of prices.

See also the Automatic Controls section for additional requirements for automatic control systems manuals. Detailed requirements for specific equipment and systems may also be included in their respective specification sections.

The Contractor shall remove and preserve all tags and instructions that come packaged with or attached to equipment used on the project. Deliver all such documents to the Owner bound in a three-ring binder or with the Operation and Maintenance Manual. Insert documents in sleeves if they cannot be punched. Scan all such documents to Adobe PDF format and provide with the Operation and Maintenance (O&M) Manual.

Prior to the receipt of payment for more than 90 percent of the work, the Contractor shall deliver to the Owner acceptable manufacturer's operating and maintenance instructions covering equipment and systems installed on the Project requiring operational and/or maintenance procedures and for any additional items indicated by the Owner, including coatings furnished under this contract.

The operating and maintenance instructions shall include, as a minimum, the following data for each coating and item of mechanical and electrical equipment:

#### Products

- A. Equipment Identification including brand name, model number and serial numbers.
- B. Date of manufacture and date of installation on job site.
- C. Complete as-built elementary wiring and one-line diagrams.
- D. Complete parts list, by generic title and identification number, complete with exploded views of each assembly.

#### Maintenance

- A. Recommended spare parts.
- B. Recommended preventive maintenance procedures and schedules. Schedule shall be provided for daily, weekly, monthly, quarterly, semi-annually and annually maintenance.
- C. Disassembly and re-assembly instructions including parts identification and a complete parts breakdown for all equipment.
- D. Weights of individual components of each item of equipment weighing over 50 pounds.
- E. Name, location, and telephone number of the nearest suppliers and spare parts warehouses.

- F. All manufacturers' warranties. Include name, address, and telephone number of the manufacturer's representative to be contacted for warranty, parts, or service information.

### Operation

- A. Recommended trouble-shooting and startup procedures.
- B. Recommended step-by-step operating procedures.
- C. Emergency operation modes, if applicable.
- D. Normal shutdown procedures.
- E. Long term shutdown (mothballing) procedures.
- F. Equipment specifications and guaranteed performance data.
- G. General manuals which describe several items not in the contract will not be accepted unless all references to irrelevant equipment are neatly eradicated or blocked out.

Provide 2 hard copies of O&M manuals and 2 electronic sets on flash drives.

Each set of instructions shall be bound into multiple volumes; each volume to be complete with an index and bound in a suitable, hard-covered binder. Binders shall be of hardback construction with full-length metal hinge. Capacity shall be 3-inch to 5-inch as appropriate for the quantity of O&M documentation. More than one binder may be required for large projects. Binders shall be equal to Wilson-Jones WLJ344 series or WLJ369 series or Specialty Loose Leaf models 87784, 98085, 98086, or 98984.

Manuals shall be assembled and indexed so that information on each coating and piece of equipment can be readily found.

Progress payments for the total contract work in excess of 90 percent completion may not be made until the operation and maintenance manual has been delivered and approved by the Owner, at their discretion.

The Contractor shall secure and deliver to the Owner all equipment warranties and other warranties and guarantees required for all equipment and processes. Delivery shall be done at one time covering all major and minor equipment warranties. Copies of the warranties shall be included in each O&M Manual.

See Division 1.43.20 for details regarding required warranties for specific components.

### 1.78.39 Project Record Documents

Prior to receiving final payment for the work, the Contractor shall deliver a complete set of acceptable "As-Constructed" records to the Owner. Plans shall be made on clean, unmarked prints for this project in accordance with the following standards:

- Yellow markings or highlights = deleted items
- Red markings = new or modified items

The Contractor shall provide "as-built" information on all items and work shown on the plans showing details of the finished product including dimensions, locations, outlines, changes,

manufacturers, etc. The information must be in sufficient detail to allow the Owner's personnel to locate, maintain, and operate the finished product and its various components.

See also electrical plan requirements in Division 16.05.

## 1.79 Demonstration and Training

### 1.79.10 Training

See the Automatic Control section for automatic control systems training.

At the time that the facility is ready to be put into operation, the Contractor is to conduct an operation and maintenance training meeting with the owner to explain in detail the operation and maintenance requirements of each of the facility's components. The training meeting shall not occur on the same date(s) as a startup.

Operation of the facility shall commence immediately after completion of testing, startup, and owner training and after satisfactory repairs and adjustments have been made.

## 1.80 PERFORMANCE REQUIREMENTS

### 1.81 Facility Performance Requirements

#### 1.81.30 Seismic Restraint and Anchorage

Contractor shall install seismic restraints when called for in the contract or recommended by the product manufacturer. Install in accordance with the manufacturer's requirements as applicable.

Seismic restraint systems shall be installed so as not to interfere with normal operations and maintenance of the equipment and other components as shown on the plans. Interference with normal operations and maintenance shall be as determined by the Owner. Drilled-in anchors for non-rotating equipment shall be Concrete Anchors unless otherwise specified.

#### 1.81.45 Location Designations

The following location designations shall be used except where otherwise noted on the plans:

**Dry Locations:** Indoor continually dry areas including office, laboratory, blower, and electrical rooms.

**Wet Locations:** All locations exposed to the weather, whether under a roof or not, or within channels, basins or tanks.

**Damp Locations:** Process areas; areas containing pumps, valves, and major piping; all spaces wholly or partially underground, or having a wall or ceiling forming part of a channel or tank, unless otherwise designated on the Plans. Any areas which do not fall within the definitions for dry, wet, or corrosive shall be considered damp.

**Corrosive Locations:** Areas where chlorine gas under pressure, sulfuric acid, or liquid polymer are stored or processed, sewer wetwells and sewer manholes.

**Immersed or Submerged Locations:** Areas which are periodically, or continuously submerged in, or contain a liquid.

**DIVISION 16**  
**ELECTRICAL**

# Division 16

## Electrical

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### 16.00 GENERAL

The Contractor shall provide all labor, material, tools, equipment and services required to complete the furnishing, installation, wiring, connection, calibration, adjustment, testing and operation of all electrical equipment, devices and components as indicated and implied by the plans and specifications.

Sections in these specifications titled “*Common Work for . . .*” shall apply to all following sections whether directly referenced or not.

The Contractor shall reference Division 1.25 regarding substitutes and “or-equals”.

### 16.05 Common Work for Electrical

#### Part 1 - General

##### Summary

Plans are diagrammatic and indicate general arrangements of systems and equipment, except when specifically, dimensioned or detailed. The intention of the plans is to show size, capacity, approximated location, direction and general relationship of one work phase to another, but not exact detail or arrangement.

##### Regulatory Requirements

The Contractor shall coordinate and provide all permits, licenses, approvals, inspections by the authority having jurisdiction and other arrangements for work on this project and all fees shall be paid for by the Contractor. The Contractor shall include these fees in the bid price.

##### Related Sections

See the following sections for items that may be provided and/or installed with other electrical equipment.

- 1.88 Location Designations
- Division 17 Automatic Control

##### Codes and Standards

Provide all electrical work in accordance with latest edition of National Electrical Code, National Electrical Safety Code, Washington State Electrical Code, and local ordinances. If any conflict occurs between government adopted code rules and these specifications, the codes are to govern. All electrical products shall bear a label from a certified testing laboratory recognized by the State of Washington. Recognized labels in the State of Washington are UL, ETL, and CSA-US.

##### Definitions

The words “plans” and “drawings” are used interchangeably in this specification and in all cases shall be interpreted to mean “Plans”.

The word “provide” shall be interpreted to mean furnish and install.

## Design Requirements

Unless otherwise noted, provide enclosures as follows:

1. Class 1, Division 1 and 2 Locations: NEMA Type 7
2. Indoors Unclassified Locations: NEMA Type 12
3. Corrosive Locations: NEMA Type 4X
4. Outdoors and/or Wet Locations: NEMA Type 4X
5. Electrical Rooms: NEMA Type 1

## Submittals

Provide submittals of each item specified in this division to engineer for approval in accordance with Division 1 of these specifications. Submittals for motor control centers, motor control panels, control panels, instrumentation panels, and pump control panels shall include at a minimum: a wiring diagram or connection schematic, and an interconnection diagram.

### Wiring Diagram or Connection Schematic

1. This plan or plans shall include all of the devices in a system and show their physical relationship to each other including terminals and interconnecting wiring in assembly. This diagram shall be in a form showing interconnecting wiring only by terminal designations (wireless diagram).

### Interconnection Diagram

1. This diagram shall show all external connections between terminals of equipment and outside points, such as motors and auxiliary devices. References shall be shown to all connection diagrams which interface to the interconnection diagrams. Interconnection diagrams shall be of the continuous line type. Bundled wires shall be shown on a single line with the direction of entry/exit of the individual wires clearly shown. All devices and equipment shall be identified. Terminal blocks shall be shown as actually installed and identified in the equipment complete with individual terminal identification. All jumpers, shielding and grounding termination details not shown on the equipment connection diagrams shall be shown on the interconnection diagrams. Spare wires and cables shall be shown.

Submittal information shall be provided to the Owner for the following items:

1. Underground Marking Tape
2. Conduit and Fittings
3. Outlet and Junction Boxes
4. Wire and Cables
5. Other Electrical Components listed in this Division and/or required by the Engineer.

## **Project Conditions**

Contractor shall keep all power shutdown periods to a minimum. Carry out shutdowns only after a shutdown schedule has been submitted and approved by both the Owner and the Engineer.

## **Construction Power**

See Division 1.51

## **Owner Provided Equipment**

Owner (City) shall provide Contractor with a submersible level transmitter for installation by the Contractor where shown on the Plans. Contractor shall provide all cables, conductors, raceways, materials, and labor necessary to install the Owner provided equipment.

## **Part 2 - Products**

### **Source Quality Control**

Provide adequate space and fit for the electrical installation, including, but not limited to, determination of access-ways and doorways, shipping sections, wall and floor space, and space occupied by mechanical equipment. Provide electrical equipment that fits in the areas shown on the Plans. All equipment shall be readily accessible for maintenance, shall have electrical clearances in accordance with National Electric Code (NEC) and shall be installed in locations which will provide adequate cooling.

Do not use equipment exceeding dimensions indicated or equipment or arrangements that reduce required clearances or exceed specified maximum dimensions unless approved by the Engineer.

### **Identification of Listed Products**

Electrical equipment and materials shall be listed for the purpose for which they are to be used, by an independent testing laboratory. When a product is not available with a testing laboratory listing for the purpose for which it is to serve, the inspection authority may require the product to undergo a special inspection at the manufacturer's place of assembly. All costs and expenses incurred for such inspections shall be included in the original contract price.

### **Materials**

Use equipment, materials and wiring methods suitable for the types of locations in which they will be located, as defined in Definitions above.

All materials and equipment specified herein shall, within the scope of UL Examination Services, be approved by the Underwriter's Laboratories for the purpose for which they are used and shall bear the UL label.

### **Components**

Fasteners for securing equipment to walls, floors, and the like shall be either hot-dip galvanized after fabrication or stainless steel. Provide stainless steel fasteners in corrosive locations. When fastening to existing walls, floors, and the like, provide capsule anchors, not expansion shields. Size capsule anchors to meet load requirements. Minimum size capsule anchor bolt is  $\frac{3}{8}$ -inch.



## Accessories

### Wire Identification

1. Identify each wire or cable at each termination and in each pull-box using numbered and lettered wire markers. All electrically common conductors shall have the same number. Each electrically different conductor shall be uniquely numbered. Identify panelboard circuits using the panelboard identification and circuit number. Identify motor control circuits using the equipment identification number assigned to the control unit by the motor control center manufacturer and the motor control unit terminal number. Identify other circuits as approved by the Engineer. Identify each wire or cable in each pull-box with plastic sleeves having permanent markings. Conductors between terminals of different numbers shall have both terminal numbers shown at each conductor end. The terminal number closest to the end of the wire shall be the same as the terminal number.

## Finishes

Refer to each electrical equipment section of these specifications for painting requirements of equipment enclosures.

## Part 3 - Execution

### Installation

#### General

1. Complete the wiring, connection, adjustment, calibration, testing and operation of mechanical equipment having electrical motors and/or built-in or furnished electrical components in accordance with electrical code, UL listing requirements and manufacturer's instructions. Install electrical components that are furnished with mechanical equipment.
2. Provide the size, type and rating of motor control devices, equipment and wiring necessary to match the ratings of motors furnished with mechanical equipment.
3. Complete the procurement, installation, wiring, connection, calibration, adjustment, testing and operation of all electrical devices, components accessories and equipment which is not shown or specified but which is nonetheless required to make the systems shown and specified properly functional.

#### Workmanship

1. Assign a qualified representative who shall supervise the electrical construction work from beginning to completion and final acceptance.
2. Provide all labor using qualified craftsmen, who have had experience on similar projects.
3. Ensure that all equipment and materials fit properly in their installations.

#### Field Services

1. Provide field services of qualified technicians to supervise and check out the installation of the equipment, to supervise and check out interconnecting wiring, to conduct start-up and operation of the equipment, and to correct any problems which occur during testing and start-up.

### Installing Equipment

1. Provide the required inserts, bolts and anchors, and securely attach all equipment and materials to their supports.
2. Install all floor-mounted equipment on 3½-inch high reinforced concrete pads.
3. Install all equipment and junction boxes to permit easy access for normal maintenance.

### Cutting, Drilling, and Welding

1. Provide any cutting, drilling, and welding that is required for the electrical construction work.
2. Structural members shall not be cut or drilled, except when approved by the Engineer. Use a core drill wherever it is necessary to drill through concrete or masonry. Perform patch work with the same materials as the surrounding area and finish to match.

### Metal Panels

1. Mount all metal panels, which are mounted on, or abutting concrete walls in damp locations or any outside walls ¼-inch from the wall and paint the back side of the panels with a high build epoxy primer with the exception of stainless-steel panels. Film thickness shall be 10 Mils minimum.

### Seismic Requirements

1. See Division 1.81.30

### Load Balance

1. Balance electrical load between phases as nearly as possible on panelboards, motor control centers, and other equipment where balancing is required.
2. When loads must be reconnected to different circuits to balance phase loads, maintain accurate record of changes made, and provide circuit directory that lists final circuit arrangement.

## **Field Quality Control**

### Minor Deviations

1. The electrical plans are diagrammatic in nature and the location of devices, fixtures, and equipment is approximate unless dimensioned. On the basis of this, the right is reserved by the owner to provide for minor adjustments and deviations from the locations shown on the Plans without any extra cost. Deviations from the Plans and/or specifications required by code shall also be done, subsequent to Owner's approval, without extra cost.
2. Plans indicate the general location and number of the electrical equipment items. When raceway, boxes, and ground connections are shown, they are shown diagrammatically only and indicate the general character and approximate location. Layout does not necessarily show the total number of raceways or boxes for the circuits required. Furnish, install, and place in satisfactory condition all raceways, boxes, conductors, and connections, and all of the materials required for the electrical systems shown or noted in the contract documents complete, fully operational, and fully tested upon the completion of the project.

### Project Record Plans

1. A set of Plans shall be maintained at the job site showing any deviations in the electrical systems from the original design. A set of electrical Plans, marked in red to indicate the routing of concealed conduit runs and any deviations from the original design, shall be submitted to the Engineer for review at the completion of the project prior to final acceptance.
2. After testing and acceptance of the project the Contractor shall furnish in the O&M manuals an accurate connection schematic and interconnection diagram for every service entrance panel, pump control panel, motor control center, and instrumentation panel provided this project.

### **Cleanup and Equipment Protection**

#### Equipment Protection

1. Exercise care at all times after installation of equipment, motor control centers, control panels, etc., to keep out foreign matter, dust debris, and moisture. Use protective sheet metal covers, canvas, heat lamps, etc., as needed to ensure equipment protection.

#### Cleaning Equipment

1. Thoroughly clean all soiled surfaces of installed equipment and materials upon completion of the project. Clean out and vacuum all construction debris from the bottom of all equipment enclosures.

#### Painting

1. Repaint any electrical equipment or materials scratched or marred in shipment or installation, using paint furnished by the equipment manufacturer.

#### Final Cleanup

1. Upon completion of the electrical work, remove all surplus materials, rubbish, and debris that accumulated during the construction work. Leave the entire area neat, clean and acceptable to the Owner.
2. Lamps and fluorescent tubes shall be cleaned, and defective units replaced at the time of final acceptance.

## **16.10 ELECTRICAL SITE WORK**

### **16.10.1 Common Work for Electrical Site Work**

#### **Part 1 – General**

##### **Summary**

The work included in this section consists of furnishing and installing conduit, fittings, handholes, pull vaults, warning tape, cables, wires, and related items, complete as specified herein and as indicated on the Plans for a complete and functional underground electrical system. Special vaults, grounding, trench backfill requirements may be specified with the particular equipment or electrical system involved.

## Related Sections

Raceways and conduit shall be provided per Section 16.70.

Wire and cable shall be provided per Section 16.60.

## Design Requirements

Materials and equipment shall conform to the respective specifications and standards; and to be the specifications herein. Electrical rating shall be as indicated on Plans.

## Part 3 – Execution

### Construction

Provide all excavation, trenching, backfill and surface restoration required for the electrical work.

Trenching shall be to depths as required by Code, particular installation, or as shown on the Plans. Trench width and length as required by the installation or as shown. Trench bottom shall be free of debris and graded smooth. Where trench bottom is rock or rocky or contains debris larger than 1 inch or material with sharp edges, over excavate 3 inches and fill with 3 inches of sand. Separation between new electrical utilities and other utilities shall be 12 inches minimum, except gas line separation shall be 12 inches both vertical and horizontal. Perform crossing of concrete or asphalt only after surface material has been saw cut to required width and removed.

Backfill around raceways shall be 3-inches of pea gravel or sand for systems of 600 volt or less. Provide red marker tape over raceways below grade. Place backfill material to obtain a minimum degree of compaction of 95 percent of maximum density at optimum moisture content. Moisten backfill material as required to obtain proper compaction. Do not use broken pavement, concrete, sod, roots or debris for backfill.

## 16.10.2 Underground Marking Tape (Detectable Type)

### Part 2 – Products

#### Manufacturers

Tape shall be Brady “Detectable Identoline – Buried Underground Tape”, or equal.

#### Materials

Underground marking tape shall be for location and early warning protection of buried power and communication lines. Tape shall be detectable by a pipe/cable locator or metal detector from above the undisturbed ground. Tape shall be nominally 2 inches wide with a type B721 aluminum foil core laminated between two layers of 5 Mil thickness polyester plastic. The plastic color shall be red for electrical lines and orange for telephone lines.

### Part 3 – Execution

#### Installation

Unless noted otherwise on Plans, approved underground marking tape shall be installed in the trench 12 inches above and directly over the conduit or raceway.

## 16.15 Grounding and Bonding for Electrical Systems

### Part 1 - General

#### References

Service and equipment grounding shall be per Article 250 of the NEC.

#### Performance Requirements

Verify that a low-resistance ground path is provided for all circuits so an accidental contact to ground of any live conductor will instantly trip the circuit.

## 16.60 CONDUCTORS

### 16.61 Low Voltage Wire and Cable

#### Part 1 - General

##### Design Requirements

This section is for power and control conductors for 600 volts or less.

All conductors shall be copper. Wire or cable not shown on the Plans or specified, but required, shall be of the type and size required for the application and in conformance with the applicable code.

#### Part 2 - Products

##### Materials

###### Conductors

1. Solid and stranded copper wire shall be 600-volt Type THW, THWN, or THHW, Class B stranding, sizes #14 AWG, #12 AWG, and #10 AWG only. Use of THHN insulation shall not be allowed. Aluminum conductors shall not be allowed.
2. Stranded copper wire shall be 600-volt Type XHHW, Class B stranding, sizes #8 AWG and larger. Aluminum conductors shall not be allowed.

###### Splices

1. For Lighting Systems and Power Outlets: Wire nuts shall be twist-on type insulated connectors utilizing an outer insulating cover and a means for connecting and holding the conductors firmly.
2. All Equipment: Crimp type connectors shall be insulated type, suitable for the size and material of the wires and the number of wires to be spliced and for use with either solid or stranded conductors.
3. Division 16 Equipment and Power Conductors: Bolted pressure connectors shall be suitable for the size and material of the conductors to be spliced.
4. All Equipment: Epoxy splice kits shall include epoxy resin, hardener, mold, and shall be suitable for use in wet and hazardous locations.

### Terminations

1. Crimp type terminals shall be self-insulating sleeve type, with ring or rectangular type tongue, suitable for the size and material of the wire to be terminated, and for use with either solid or stranded conductors.
2. Terminal lugs shall be split bolt or bolted split sleeve type in which the bolt or set screw does not bear directly on the conductor.
3. Wire Markers shall be plastic sleeve type. Wire numbers shall be permanently imprinted on the markers.

### **Finishes**

Color Coding: Provide color coding for all circuit conductors. Insulation color shall be white for neutrals and green for grounding conductors. An isolated ground conductor shall be identified with an orange tracer in the green body. Ungrounded conductor colors shall be as follows:

1. 120/208 Volt, 3 Phase: Red, black and blue.
2. 277/480 Volt, 3 Phase: Yellow, brown and orange.
3. 120/240 Volt, 1 Phase: Red and black.

## **Part 3 – Execution**

### **Location (Installation) Schedule**

Provide the following conductors for the following applications:

1. Use stranded copper conductors for all power and control circuits unless noted otherwise on plans or below. Size as noted on the Plans.
2. Contractor may use solid copper conductors for lighting and receptacle circuits using screw-type terminals. Size as noted on the Plans.
3. Size #14 AWG wire or smaller shall not be allowed on power circuits.

### **Installation**

#### Conductor Splices

1. Splices: Install all conductors without splices unless necessary for installation, as determined by the Engineer. Splices when permitted shall be completed using an approved splice kit intended for the type of conductor and the application. The splice shall be in accordance with the splice kit manufacturer's instructions.
2. Underground Splices: All underground outdoor splices when approved by Engineer shall be completed in an accessible pullbox or handhole using an approved watertight epoxy resin splice kit rated for the application up to 600 volts. Splices will not be allowed to be direct buried.

#### Conductor Identification

1. Except for interior lighting and receptacle circuits, identify each wire or cable at each termination and in each pullbox, junction box, handhole, and manhole using numbered

and lettered wire markers. All electrically common conductors shall have the same number. Each electrically different conductor shall be uniquely numbered. Identify panelboard circuits using the panelboard identification and circuit number. Identify motor control circuits using the equipment identification number assigned to the control unit by the motor control center manufacturer and the motor control unit terminal number. Identify other circuits as shown in the circuit schedule as favorably by the Engineer.

2. Conductors between terminals of different numbers shall have both terminal numbers shown at each conductor end. The terminal number closest to the end of the wire shall be the same as the terminal number.

## Testing

Insulation Resistance Tests: For all circuits 150 volts to ground or more and for all motor circuits over ½ horsepower, test cables per NETA Paragraph 7.3.1. The insulation resistance shall be 20 megohms or more. Submit results to Engineer for review.

## 16.63 Signal Cable

### Part 2 - Products

#### Materials

##### Twisted Shielded Pairs (TSP)

1. Cable shall conform to IEEE 383, UL 13, and UL 83 and shall be type PLTC cable suitable for direct burial. Each TSP shall consist of two #16 AWG, 7-strand copper conductors per ASTM B8 with 15 Mils PVC insulation and individual conductor jacket of nylon. Conductors shall be twisted with 2-inch or shorter lay, with 100 percent foil shielding and tinned copper drain wires. The cable shall have an overall PVC jacket with a thickness of 35 Mils. The insulation system shall be rated at 90 degrees Celsius and for operation at 600 volts.

### Part 3 - Execution

#### Installation

##### Cable Installation

1. Cables shall be continuous from initiation to termination without splices.
2. Cable shielding shall be grounded at one end of the cable only. Bonding shall be to a single ground point only. Bonding from cable to cable in multiple run installations shall not be permitted.
3. Install instrumentation cables in separate raceway systems with voltages not to exceed 30 volts DC.

##### Conductor Identification

1. Except for interior lighting and receptacle circuits, identify each wire or cable at each termination and in each pullbox, junction box, handhole, and manhole using numbered and lettered wire markers. All electrically common conductors shall have the same number. Each electrically different conductor shall be uniquely numbered. Identify panelboard

circuits using the panelboard identification and circuit number. Identify motor control circuits using the equipment identification number assigned to the control unit by the motor control center manufacturer and the motor control unit terminal number. Identify other circuits as shown in the circuit schedule as determined by the Engineer.

2. Conductors between terminals of different numbers shall have both terminal numbers shown at each conductor end. The terminal number closest to the end of the wire shall be the same as the terminal number.

## Testing

Insulation Resistance Tests: Perform insulation resistance on all circuits. Make these tests before any equipment has been connected. Test the insulation with a 500 Vdc insulation resistance tester with a scale reading 100 mega ohms. The insulation resistance shall be 20 mega ohms or more. Submit results to Engineer for review.

## 16.70 RACEWAYS, BOXES, AND FITTINGS

### 16.71 Raceways

#### Part 1 – General

##### Design Requirements

Conduit sizes not noted on Plans shall be in accordance with NEC requirements for the quantities and sizes of wire installed therein.

#### Part 2 – Products

##### Components

##### Conduit and Fittings

1. Galvanized Rigid Steel (GRS): Rigid conduit shall be steel, hot dipped galvanized inside and out. The GRS must meet USA Standards Institute C80-1 Underwriters Laboratories Standard UL6 and carry a UL label. Use cast threaded hub fittings and junction boxes for all rigid conduit except in locations not permitted by the NEC.
2. PVC Coated Rigid Steel Conduit (PVC-GRS): PVC coated conduit shall meet the GRS standard above plus have a 40 Mil PVC factory applied PVC coating.
3. Nonmetallic Conduit: Nonmetallic Conduit shall be rigid PVC, Schedule 40 (PVC-40) or 80 (PVC-80). PVC conduit installed above grade shall be Schedule 80 extra heavy wall 90 degree Celsius. UL listed for aboveground use and UV resistant. Conduit shall be gray in color. Fittings shall be of the same material as the raceway and installed with solvent per the Manufacturer's instructions. Conduit, fittings, and solvent shall all be manufactured by the same Manufacturer.
4. Flexible Metal Conduit (Flex-LT): Flexible conduit shall be interlocking single strip, hot dipped galvanized and shall have a polyvinyl chloride jacket extruded over the outside to form a flexible watertight raceway. Flexible conduit shall be American Brass Company Sealtite Type VA, General Electric Type UA or equal.



### Conduit and Cable Supports

1. Conduit Supports: Hot dipped galvanized framing channel shall be used to support groups of conduit. Individual conduit supports shall be one-hole galvanized malleable iron pipe straps used with galvanized clamp backs and nesting backs where required. Conduit support for PVC or PVC coated rigid steel shall be one-hole PVC or epoxy coated clamps or PVC conduit wall hangers.
2. Ceiling Hangers: Ceiling hangers shall be adjustable galvanized carbon steel rod hangers. Unless otherwise specified, hanger rods shall be 1/2-inch all-thread rod and shall meet ASTM A193. Hanger rods in corrosive areas and those exposed to weather or moisture shall be stainless steel.

### Conduit Sealants

1. Moisture Barrier Types: Sealant shall be a non-toxic, non-shrink, non-hardening, putty type hand applied material providing an effective barrier under submerged conditions.
2. Fire Retardant Types: Fire stop material shall be a reusable, non-toxic, asbestos-free, expanding, putty type material with a 3-hour rating in accordance with UL 1479. Provide products indicated by the manufacturer to be suitable for the type and size of penetration.

## **Part 3 - Installation**

### **Raceway Applications**

Galvanized Rigid Steel (GRS) conduit shall be used in all locations unless noted otherwise below or on the Plans.

ABOVE GRADE CONDUITS (non-corrosive areas) shall be:

1. GRS for power and control wiring.
2. GRS for instrumentation and telecommunications wiring.
3. GRS for motor leads from VFDs.

ABOVE GRADE CONDUITS (wet or corrosive areas, NFPA 70 hazardous areas) shall be:

1. PVC-GRS for power and control wiring.
2. PVC-GRS for instrumentation and telecommunications wiring.
3. PVC-GRS for motor leads from VFDs.

CONCEALED ABOVE GRADE CONDUITS shall be:

1. GRS for all wire and cable types in wood stud frame walls.
2. PVC-40 for power and control wiring in concrete block or brick walls.
3. PVC-40 for instrumentation and telecommunications wiring in CMU or brick walls.
4. GRS for motor leads from VFDs in CMU or brick walls.

BELOW GRADE CONDUITS IN DIRECT EARTH (not under slabs-on-grade) shall be:

1. PVC-40 for power and control wiring.

- a) Sweeps and risers for transition of PVC from below grade to above grade shall be PVC-GRS.
2. PVC-GRS for instrumentation and telecommunications wiring.
3. PVC-GRS for motor leads from VFDs.

UNDER SLABS-ON-GRADE CONDUIT shall be:

1. PVC-40 for power and control wiring
  - a) Sweeps and risers for transition of PVC from below grade to above grade shall be PVC-GRS.
2. PVC-GRS for instrumentation and telecommunications wiring.
3. PVC-GRS for motor leads from VFDs.

CONCRETE-ENCASED CONDUITS shall be:

1. PVC-40 for power and control wiring
  - a) Sweeps and risers for transition of PVC from below grade to above grade shall be PVC-GRS.
2. PVC-40 for instrumentation and telecommunications wiring.
  - a) Sweeps and risers for transition of PVC from concrete-encasement to above grade shall be PVC-GRS.
3. PVC-GRS for motor leads from VFDs.

ALL CONNECTIONS TO VIBRATING EQUIPMENT OR MOTORS shall be:

1. Liquidtight flexible metallic conduit for indoor, non-corrosive areas and all motor leads from VFDs.
2. Connection to equipment outdoors or in corrosive areas shall be with non-metallic liquidtight flexible conduit (except for motor leads from VFDs shall be flexible metallic.)

## Installation

### Size of Raceways:

1. Raceway sizes as shown on the Plans, if not shown on the Plans, then size in accordance with NFPA 70.
2. Unless specifically indicated otherwise, the minimum raceway size shall be:
  - a) Conduit:  $\frac{3}{4}$ -inch
  - b) Wireway: 4-inch by 4-inch

All raceways shall contain a separate grounding conductor.

Spare conduits shall contain one  $\frac{3}{16}$ -inch diameter nylon pull rope.

Conduit routing is shown diagrammatic on the Plans. Contractor is responsible for routing the conduits in a neat manner, parallel and perpendicular to walls and ceilings.

Location of conduit ends are shown approximately. Contractor is responsible for ending conduits in location that will not conflict with electrical equipment. Route conduit ends to facilitate ease of equipment maintenance. Conduits extending from the floor to a device shall be located as close as possible to avoid creating a hazard.

Conduit shall not be routed on exterior of structures except as specifically indicated on the Plans.

Where water cannot drain to openings, provide drain fittings in the low spots of the conduit run.

Securely fasten raceways at intervals and locations required by NEC, or the type of raceway employed.

Provide all required openings in walls, floors and ceilings for conduit penetration.

1. Do not install one (1) inch and larger raceways in or through structural members (beams, slabs, etc.) unless approved by Engineer.
2. New Construction: Avoid cutting openings, where possible, by setting sleeves or frames in masonry and concrete, and by requesting openings in advance.
3. Existing Construction: Core drill openings in masonry and concrete. Avoid structural members and rebar.

Conduit encasement or embedment in the earth shall be separated from the earth by at least 3-inches of concrete unless otherwise shown on the Plans. Plastic conduit spacers shall be located five feet on centers. The spacers shall be secured to the conduits by wire ties. The conduits shall be watertight.

Analog signal conduits shall be separated from power or control conduits. The separation shall be a minimum of 12-inches for metallic conduits and 24-inches for nonmetallic conduits.

Install explosion-proof seal-offs in hazardous areas shown on the Plans and as required by the NEC.

Plastic raceway joints shall be solvent cemented in accordance with recommendations of raceway manufacturer.

All conduit openings not encased in a panel shall be sealed with duct seal.

## **16.72 Boxes and Enclosures**

### **16.72.2 Outlet and Junction Boxes**

#### **Part 1 – General**

##### **Design Requirements**

In corrosive areas, all junction boxes shall be NEMA 4X.

Outlet boxes and switch boxes shall be designed for mounting flush wiring devices.

Outlet boxes shall not be less than 4-inch square and 1½-inch deep. Ceiling boxes shall withstand a vertical force of 200 pounds for five minutes. Wall boxes shall withstand a vertical downward force of 50 pounds for five minutes.

## Part 2 – Products

### Materials

Use cast boxes with threaded hubs for all rigid and intermediate conduits. Steel boxes may be used with rigid and intermediate conduits where cast boxes are not allowed by the NEC. All boxes shall be of proper size to accommodate devices, connectors, and number of wires present in the box. Boxes shall be readily accessible.

Cast box bodies and cover shall be cast or malleable iron with a minimum wall thickness of 1/8-inch at every point, and not less than 1/4-inch at tapped holes for rigid conduit. Bosses are not acceptable. Mounting lugs shall be provided at the back or bottom corners of the body. Covers shall be secured to the box body with No. 6 or larger brass or bronze flathead screws. Boxes shall be provided with neoprene cover gaskets. Outlet boxes shall be of the FS types. Boxes shall conform to FS W-C-586C and UL 514.

Sheet metal boxes shall conform to UL 50, with a hot-dipped galvanized finish conforming to ASTM A123. Boxes and box extension rings shall be provided with knockouts. Boxes shall be formed in one piece from carbon-steel sheets.

Non-metallic boxes shall be hot-compressed fiberglass, one-piece, molded with reinforcing of polyester material, with a minimum wall thickness of 1/8-inch.

### Finishes

Where only cast aluminum is available for certain types of fixture boxes, an epoxy finish shall be provided.

## 16.72.3 Watertight Enclosures

### Part 2 – Products

#### Manufacturers

The watertight enclosure shall be equal to Hoffman.

#### Materials

Watertight enclosures for vault electrical outlets shall be molded from fiberglass reinforced polyester material. A hinged cover shall be gasketed and opened with quick release latches. The conduit penetrations shall be sealed watertight.

### Part 3 – Execution

#### Installation

An epoxy plug shall be installed in the conduit to prevent the migration of water into the conduit. The enclosure shall be NEMA rated and installed per all applicable codes.

## 16.95 Testing

### 16.95.1 Common Work for Testing

#### Part 1 - General

##### Submittals

Test reports shall be submitted to the Engineer prior to final acceptance in accordance with Division 1.33 of these specifications.

##### Scheduling and Coordination

The Contractor shall inform the Engineer in advance of testing in accordance with the requirements listed in Division 1 of these specifications.

Prior to scheduling the testing, the Contractor shall have satisfied themselves that the project area is properly cleaned up; all patching and painting deemed necessary properly completed; and all systems, equipment and controls are functioning as intended.

#### Part 2 - Products

##### Source Quality Control

Submit reports of factory tests and adjustments performed by equipment manufacturers to the Engineer prior to field testing and adjustment of equipment. These reports shall identify the equipment and show dates, results of test, measured values and final adjustment settings. Provide factory tests and adjustments for equipment where factory tests are specified in the equipment specifications. The Engineer may inspect the fabricated equipment at the factory before shipment to job site. Provide the Engineer with sufficient prior notice so that an inspection can be arranged at the factory.

#### Part 3 – Execution

##### Site Testing

Test all circuits for continuity, freedom from ground, and proper operation during progress of the work.

Insulation Resistance, Continuity, and Rotation: Perform routine insulation resistance, continuity and rotation tests for all distribution and utilization equipment prior and in addition to tests performed by the testing laboratory specified herein.

Electric Motors: Perform voltage, current and resistance tests on all motors  $\frac{1}{2}$  horsepower and larger installed this project. Insulation resistance readings shall be taken with a 500-volt megger for 30 seconds with the circuit conductors connected to the motor. Verify that an overload condition does not exist.

Conduct special test as required for service and/or system ground.

## Field Quality Control

### General

1. Conduct final test in the presence of Owner and/or their authorized representative. Contractor shall provide all testing instrumentation and labor required to demonstrate satisfactory operation of systems, equipment and controls.

### Operational Tests

1. Operational test all circuits to demonstrate that the circuits and equipment have been properly installed, adjusted and are ready for full-time service. Demonstrate the proper functioning of circuits in all modes of operation, and including alarm conditions, and demonstrate satisfactory interfacing with the data acquisition and alarm systems.

**DIVISION 17**  
**AUTOMATIC CONTROL**

# Division 17

## Automatic Control

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### 17.00 GENERAL

This division covers all work necessary for furnishing, installing, adjusting, testing, documenting, and starting-up the Instrumentation and Control (I&C) and Telemetry System. Programmable logic controller (PLC) shall provide local, automatic control of on-site pumps. Computer-based telemetry system will provide remote control, alarm presentation, and data logging activities at the Owner's headquarters location.

Sections in these specifications titled “*Common Work for . . .*” shall apply to all following related subsections whether directly referenced or not.

These specifications are an integral part of the contract documents for the I&C and Telemetry portion of this contract. The written descriptions of system performance contained herein are given to assist the Contractor in interpreting the contract plans but are not intended to be all-inclusive. The Contractor shall be aware that all automatic control systems do not require the same components and accessories for complete system operation. Therefore, these specifications do not include all accessories and appurtenances required for a complete system. The Contractor shall, however, provide all accessories and appurtenances to result in a completely operational system as required to meet the functional requirements of these documents. Where specific equipment specifications are given, they are used to represent the level of quality required by these documents.

### 17.05 Common Work for Automatic Control

#### Part 1 - General

##### Summary

The work under this division covers construction specifically described in these specifications. Project Plans will be provided for this project. All work incidental and necessary to the completion of the project described herein shall be completed under the bid item listed in the bid proposal, and no other compensation will be allowed. The work generally consists of the following:

- Detailed system layout and design for the particular equipment bid in accordance with these functional specifications.
- Furnishing of I&C equipment including delivery, storage, software, programming, installation, testing, startup, and documentation.
- Providing operator maintenance manuals for all equipment and devices provided by this Contract.
- Providing system training to the operators of the proposed equipment.



## Related Sections

- Division 16 Electrical

## References

The project Plans are based on Instrument Society of America (ISA) standards numbers S5.1, S5.2, S5.3, and S5.4. The Contractor is encouraged to be familiar with these standards since the project plans do not contain wiring or ladder diagrams, but are based on the functional requirements of the ISA format.

All equipment and materials shall conform to the latest revised editions of applicable standards published by the following organizations:

- American National Standards Institute (ANSI).
- Institute of Electrical and Electronic Engineers (IEEE).
- National Electrical Manufacturers Association (NEMA).
- Underwriters' Laboratories (U/L).
- Instrument Society of America (ISA)

All equipment and materials, and the design, construction, installation, and application thereof shall comply with all applicable provisions of the National Electrical Code (NEC), the Occupational Safety and Health Act (OSHA), and any applicable Federal, State, and local ordinances, rules and regulations. All materials and equipment specified herein shall be within the scope of Underwriter's Laboratory (UL) examination services, be approved by the UL for the purpose for which they are used and shall bear the UL label.

All control panels shall bear a label by UL or by an approved testing authority for the completed assembled panel.

## Definitions

**Contractor:** The Contractor, as distinct from the Control System Integrator, shall install panels and other materials furnished by the Control System Integrator and provide all materials and work necessary and thereby, satisfy all requirements that are within the scope of this section.

**Control System Integrator:** A single company subcontracted by the Contractor, who shall design and furnish the system, provide the instrument panels; provide the PLCs, RTU, startup, training services, and other instrument components.

**Control System Programmer:** A single firm, pre-selected and contracted by the owner, who shall furnish all programming, startup and training services related to programming. The Control System Programmer shall be RH2 Engineering, Inc.

## Submittals

All submittals shall be complete, neat, orderly and indexed. Partial submittals will not be accepted. Submittal information shall be provided to the Owner for the following items:

- Lift Station No. 7 Telemetry Panel
- Motor Current Sensors

- Control Panel Temperature Transmitter
- Operation and Maintenance Manuals per Division 1.79.2 and Division 17.94
- Full size nameplate wording schedules, in lettering style proposed for use.

In addition to the requirements of Division 1.33, the Contractor shall develop and submit the following information provided by the Control System Integrator.

#### Hardware Submittals

Before any components are fabricated, and/or integrated into assemblies, or shipped to the site, the Contractor shall prepare a complete hardware submittal. The Engineer shall require five (5) sets, including fully detailed shop drawing, catalog cuts, wiring connections, and such other descriptive matter and documentation as may be required to fully describe the equipment and to demonstrate its conformity to these Specifications. The decision of the Engineer, upon the acceptability of any submittal, shall be final. Catalog information shall be submitted for all components and equipment, regardless of whether or not it is of the same manufacture as that listed in the Specifications.

#### System Plan Submittals

Following approval of the hardware submittal, the Control System Integrator shall prepare complete system interconnect wiring diagrams and panel layout plans for approval.

#### Plans

The Control System Integrator shall develop all shop drawings required for design, fabrication, assembly and installation of the control system. Shop drawings shall include all plans required in manufacture of specialized components and for assembly and installation of them.

Plans shall be prepared with a CAD program capable of exporting to AutoCAD format, and printed on 11-inch by 17-inch media. Plans shall have borders and title blocks identifying the project system, revisions to the plans, and type of plan. Each revision of a plan shall carry a date and brief description of the revisions. Diagrams shall carry a date and brief description of the revisions. Diagrams shall carry a uniform and coordinated set of wire numbers and terminal block numbers in compliance with panel work wiring. Additionally, one set of electronic .DWG files shall be provided to the Owner.

#### Elementary Diagrams

The Contractor shall provide elementary diagrams for all discrete loops. Loop diagrams shall be prepared in compliance with ISA S5.4 and shall be provided for all analog loops. Elementary diagrams and loop diagrams shall show circuits and devices of a system. These diagrams shall be arranged to emphasize device elements and their functions as an aid to understanding the operation of a system and maintaining or troubleshooting that system. Elementary and loop diagrams shall also show wire numbers, wire color codes, signal polarities, and terminal block numbers.

#### Panel Fabrication and Arrangements Plans

The Contractor shall provide arrangement plans of all panel front- and internal-mounted instruments, switches, devices, and equipment indicated. All panel mounting details shall be

shown. Outer dimensions of all panels shall be included on the plan. Deviations from approved arrangements require approval prior to installation.

Arrangement plans shall be drawn to scale using standard Architectural or Engineering scales.

### **Site Conditions**

Specified instrumentation and control equipment shall be modified, if necessary, to make it suitable for operation in the ambient conditions specified in Division 1.

### **Warranty**

In addition to any other warranties required by the specifications, the entire PLC system will be warranted against defects in materials, workmanship, and software functions for a period of one (1) calendar year following the successful completion of the Functional Acceptance Test (FAT). The Contractor or designated service organization will be available on 24-hour notice to correct any system problems without charge to the Owner during the warranty period. In addition, the Contractor will provide four 2-day site visits during the warranty period to perform inspection and calibration of the equipment or other work at the request of the Owner.

### **Extra Materials**

The Contractor shall supply sufficient spare parts, components, and assemblies to replace *any* defective or malfunctioning control component provided in this system. Control components are considered any device or combination of devices without which normal automatic control as outlined in this specification cannot be accomplished, and includes:

1. Two (2) spares of each part, component, or assembly, if more than ten (10) of those components are normally in use in the system.
2. One (1) box of each fuse type provided on this project. If ten (10) or more of a fuse type is provided for the project, then two (2) spare boxes shall be provided.
3. One (1) spare relay of each rating type provided on this project.

Spare part components shall be packaged for at ease of field installation by non-trained personnel, so that no soldering or special skills are required for installation. All spare parts shall be delivered in a hinged plastic box that is purposefully made for this contract. The box shall have a parts list permanently attached to the inside lid which lists all parts and refers to them by numbered code visible on the outside of the package. Fragile components shall be adequately protected with cut foam. Electronic components shall be wrapped in ultra-violet inhibiting file. The exterior of the box shall be labeled "SCADA Spare Parts." Provide the box with lifting handles.

## **Part 2 – Products**

### **Components**

These Specifications list major instruments required to provide the process instrumentation system. All instrument functions specified on this list shall be provided by the Control System Integrator. Any additional instruments required to complete the instrument loops because of certain characteristics of the particular equipment selected by the Control System Integrator

shall be provided. Such additional instruments shall be provided and included in the original contract price even though not specified in the instrument index or on the Plans.

The following systems utilize automatic control:

- Pump controls
- Level controls

### **Accessories**

Provide all accessories required to furnish a complete control system that meets the requirements of the Plans and Specifications.

### **Source Quality Control**

Material shall be new, free from defects, and of the quality specified. All equipment and materials utilized in the system shall be the products of Manufacturers with at least five (5) years of experience in the manufacture of similar equipment. Similar items in the system shall be the products of the same Manufacturer. All equipment shall be of industrial grade and of standard construction, shall be capable of long, reliable, trouble-free service, and shall be specifically intended for control and monitoring of operation of motor-driven pumps and equipment. All equipment shall be of modular design to facilitate interchangeability of parts and to assure ease of servicing.

## **Part 3 - Execution**

### **Installers**

Installation shall be performed by the workers who are skilled and experienced in the installation of I&C and Telemetry systems.

### **Installation**

Installation and testing procedures shall be as specified in these and subsequent sections of this division.

The control system shall be installed in accordance with the installation plans and instructions prepared by the Control System Integrator.

Installation shall include all elements and components of control system and all conduit and interconnecting wiring between all elements, components, sensors, and valve operators.

Equipment shall be located so that it is readily accessible for operation and maintenance.

### Field Equipment

Equipment shall be provided as specified on the Plans such that ports and adjustments are accessible for in-place testing and calibration. Where possible, equipment shall be located between 48 inches and 60 inches, unless specified otherwise on the Plans, above the floor or a permanent work platform. Instrumentation equipment shall be mounted for unobstructed access, but mounting shall not obstruct walkways. Equipment shall be mounted where shock or vibration will not impair its operation. Support systems shall not be attached to handrails, process piping or mechanical equipment except for measuring elements and valve positioners.

Instruments and cabinets supported directly by concrete or concrete block walls shall be spaced out not less than  $\frac{5}{8}$ -inch by framing channel between instrument and wall.

Steel used for support of equipment shall be hot-dip galvanized after fabrication. Support systems including panels shall be designed in accordance with the Seismic Restraint and Anchorage section of Division 1.81 of these specifications and to prevent deformation greater than  $\frac{1}{8}$ -inch under the attached equipment load and an external load of 200 pounds in any direction.

#### Electrical Power Connection

Electric power wiring and equipment shall be in compliance with Division 16. Power disconnect switches shall be provided within sight of equipment and shall be labeled to indicate opened and closed positions and specific equipment served. "Within sight of" is defined as having a clear unobstructed view from the equipment served and within 50 feet of the equipment served. Disconnect switches shall be mounted between 36 inches and 72 inches above the floor or permanent work platform. Where equipment location is such that the above requirements cannot be met by a single disconnect switch, two switches, one at the equipment and one at the work platform, shall be provided.

#### Signal Connection

Electrical signal connections to equipment shall be made on terminal blocks or by locking plug and receptacle assemblies. Jacketed flexible conduit shall be used between equipment and rigid raceway systems except that flexible cable assemblies may be used where plug and receptacle assemblies are provided and the installation is not subject to mechanical damage in normal use. The length of flexible conduit or cord assemblies shall not exceed 2 feet. Flexible cable, receptacle and plug assemblies shall be used only where specified.

## **17.06 Control System Integrator**

### **Part 1 - General**

#### **Division of Responsibility**

All instrumentation and industrial electronic systems shall be provided under the supervision of a single Control System Integrator, chosen by the Contractor, which is regularly engaged in the design and installation of such systems of similar scope and complexity. The Control Systems Integrator shall be enjoined by the Contractor as a Subcontractor. The assignment of specific responsibilities herein to the Control System Integrator shall not, in any way and under any conditions, diminish the Contractor's full and complete responsibility for all work performed and all materials installed under the contract. The contract between the Contractor and the Control System Integrator shall specifically require that the Control System Integrator conform to and meet all requirements specified in the contract documents.

The assignment of a Control System Integrator that is an equipment supplier shall not be acceptable.

#### Control System Integrator's Responsibility

The Control System Integrator shall be solely and completely responsible for the final design and assembly of the entire control system. Responsibilities include:

- Provision of, and the detailed design of, custom control panels and the motor control center. The plans show general layout of the control panels. The Integrator shall provide detailed scaled design of all components on and in the control panels and determine specific requirements.
- The design of all interconnecting wiring of control equipment including remote control panels, packaged equipment panels, mechanical equipment with control components, etc.
- Testing of the control panels in the Control System Integrator's shop.
- Coordinate with the Contractor for specific requirements and locations of raceway penetrations and field wiring in control panels.
- The Control System Integrator shall supply the Contractor with all necessary detailed installation plans and/or written instruction for installation of all control components and sensing devices for proper system operation.
- Coordinate with the Control System Programmer who has been selected by the Owner and are under separate contract with the Owner, to allow in-shop testing of the programming of all control devices and to execute the functions listed in the control strategies.
- Develop an assembly and testing schedule, with the Control System Programmer to allow for testing of all new programs in the Control System Integrator's shop.
- Provide installation assistance.
- Provide Startup and Training Services.

#### General and Electrical Contractor's Responsibilities

The General and Electrical Contractor shall be responsible for the following equipment and services:

- Review of the Control System Integrator's submittals and wiring diagrams for coordination with space requirements, raceway requirements of field wiring, etc.
- Supply the Integrator with submittals of equipment related to the control system that the Integrator must include in their submittals and integrate. Such as motors, packaged control panels that the Integrator does not build, etc.
- Installation of the control panels provided by the Control System Integrator.
- Installation of the interconnecting wiring in accordance with these documents and the Control System Integrators wiring diagrams.
- Installation of I&C and Telemetry System components in accordance with these documents and plans or instructions of the Control System Integrator.

## Part 3 – Execution

### Installers

The Control System shall be designed, constructed, programmed and commissioned by full time employees with a minimum of 5 years of experience (minimum of 1 year with Integrator).

### Integrators List

The Control System Integrator shall be selected by the Contractor from the following acceptable companies (Alphabetical Listing):

- L2 Systems LLC – Everett, Washington
- Process Solutions, Inc. – Stanwood, Washington
- Quality Control Corporation (QCC) – Lynnwood, Washington
- S&B Inc. (Stead & Associates) – Bellevue, Washington
- Systems Interface Inc. – Mukilteo, Washington
- Taurus Power and Controls, Inc. – Kent, Washington
- Technical Systems, Inc. – Lynnwood, Washington

### Alternative Integrators

Alternate Control System Integrators not listed above shall be considered for acceptability by the Owner based on following qualifications:

1. The Control System Integrator shall be an instrument and control system manufacturing company.
2. The Control System Integrator's manufacturing and assembly facility shall be located within a 100-mile drive from the City of Bonney Lake.
3. The Control System Integrator shall be specialized in the design, assembly, testing, installation and service of municipal water and wastewater control and communication systems in the Pacific Northwest for at least five years.
4. The Control System Integrator shall employ technicians and engineers with documented experience in the design, assembly, testing, installation, operation, calibration, trouble-shooting, service and repair of control, and communication systems for municipal water and wastewater utilities.
5. The Control System Integrator shall have completed the design, assembly, testing and installation of control systems that include the instruments and devices cited on the Plans by specific manufacturer's name.

An alternate Control System Integrator selected by the Contractor shall be subject to the approval by the Owner. Prior to placement of purchase orders for services and equipment, the Contractor shall provide the following information about the selected alternate Control System Integrator for review by the Owner:

1. Description of ownership and organization of Integrator.

2. Resumes of principals and/or key employees who will be working directly in the engineering, assembly, testing and commissioning of the system for this project.
3. Description of expertise in design, assembly, testing and installation of control systems for municipal utility facilities.
4. Description of municipal control systems designed, assembled and installed in the last 5 years. Description shall include:
  - Names of employees involved in each system.
  - Detailed description and plans of each system.
  - Cost of each system.
  - Names and telephone numbers of persons involved in operation and maintenance of each system.
  - Description of the service capabilities normally provided by the company including resumes of employees assigned to field service and listing of service equipment.
  - Additional information that may assist the Owner in ascertaining the company's general ability to perform the work. The acceptability of the Integrator will be determined solely by the Owner.

#### Approval of Personnel and Alternatives

The Contractor and the selected Control System Integrator shall anticipate that the Owner may withhold approval of the selected Integrator or employee if, in the opinion of the Owner, the Control System Integrator or employee does not have the experience, capability or an acceptable performance and execution record of similar projects in the past.

Neither the Contractor or Control System Integrator or employee not approved by the Owner, shall be entitled to an extension of time or to any claim for damages because of extra and unanticipated costs, hindrances, delays or complications caused by or resulting from the Owner not approving any Control System Integrator or employee for whatever reason.

## **17.07 Control System Programmer (Control System Programmer Contracted Directly by Owner)**

### **Part 1 - General**

#### **Division of Responsibility**

The Control System Programmer shall be selected and Contracted for the control system programming by the Owner. The Control System Programmer Contracted by the Owner is RH2 Engineering, Inc., who may be contacted at (425) 951-5358. It is the responsibility of the Control System Programmer to provide PLC programming that will accomplish control of the proposed and modified systems as described in the Specifications and Plans.

Control System Programmer's Responsibility:

The Control System Programmer Responsibilities include:

- Develop a testing schedule to allow for testing of all new telemetry panel programs.



- Notify the Control System Integrator of all components needed to test equipment panels.
- Software testing of the control panels in the Control System Integrator's shop.
- Programming of the PLC and operator interface.
- Provide required software startup, troubleshooting, and commissioning services needed to complete implementation of programs.

## 17.08 System Description

### Part 1 – General

#### Summary

The I&C and Telemetry system functions required are specified on the Plans and in subsequent sections of this Division.

#### Design and Performance Requirements

The system shall be designed to provide the control capabilities and functions indicated and implied by the Plans and these Specifications and to provide trouble-free operation with minimum maintenance. The system shall readily enable manual operation of any and all functions in the event of failure of any one component.

The control system shall be designed and assembled by the Control System Integrator to provide:

- Control of motor driven pumps, equipment, and processes.
- Monitoring of operation of motor driven pumps, equipment, and processes.
- Indication of operating status of motor driven pumps, equipment, and processes.
- Monitoring and indication of pressures, temperatures, levels, and flows, as indicated and implied by the Plans and Specifications.
- The capabilities indicated and implied by the Plans and Specifications.

The I&C and Telemetry System shall be designed and assembled by the Control System Integrator to be an integrated system composed completely of components which are specifically designed and used for and in conjunction with control and operation of motor-driven pumps and process control equipment. The Control System Integrator shall supply all interfacing equipment, appurtenances and accessories and all such devices that may be required for proper interfacing as part of the control system.

#### Project Conditions

The control system for this project shall consist of a Remote Telemetry Unit (RTU) based system that consists of a new RTU linked to the existing Master Telemetry Unit (MTU) via radio communications. The MTU is located at the public works building with a computer based Human Machine Interface (HMI).

RTU sites included in this project are:

1. Lift Station No. 7

## **Part 2 – Products**

### **Manufacturers**

The telemetry components of the RTU shall be manufactured by Allen-Bradley to be consistent with the Owner's existing system.

### **Components**

The I&C and Telemetry System shall include the instruments, control devices, Remote Telemetry Unit, Human Machine Interface, input and output devices, sensors, interfacing devices, cabinets, enclosures and other components indicated and implied by the Plans and Specifications.

The following is a list of the RTUs, Control Panels, Pressure and Level Assemblies, and Motor Control Centers to be provided by the Control System Integrator:

- Lift Station No. 7 Telemetry Panel

## **Part 3 – Execution**

### **Preparation**

The Control System Integrator shall be responsible for the coordination and integration of control system with the motor control and other related equipment. The Control System Integrator shall communicate directly with the Manufacturer(s) and Supplier(s) of all related equipment to determine all details of the equipment, which may influence or affect the control system. The Control System Integrator shall determine all requirements for and shall cause integration of the control system into a unified operating system. The Control System Integrator shall define all requirements for all interfacing equipment and shall supply all appurtenances, accessories and all such devices, which may be required for proper interfacing as part of the control system.

The Control System Integrator shall be responsible to obtain submittal information on equipment supplied by other disciplines and to integrate them into the control system to form a complete working package as outlined by the contract documents.

### **Installation**

The system shall be completely assembled in the shop by the Control System Integrator. All components and equipment shall be prewired to the maximum extent possible.

All Process Control shall be done within the control panels unless specifically listed on the Plans as other.

## 17.10 PANELS

### 17.12 Equipment Panels

#### Part 1 – General

##### References

Panels shall meet the requirements of UL-508 for water systems and UL-913 for sewer systems. All panels shall bear the appropriate label. The provider of the panels shall be a UL-508A certified facility. All field modifications shall be in conformance with UL-508 or UL-913.

##### Design Requirements

Control equipment panels shall be enclosures conforming to the requirements of the National Electrical Manufacturers Association (NEMA) and shall be NEMA 12 for indoor use and NEMA 4X for outdoor use.

#### Part 2 – Products

##### Components

- Enclosure shall be constructed of steel.
- Minimal metal thickness shall be 14-gauge.
- All doors shall be rubber-gasketed with continuous hinge and key locking latch mechanism.
- Wherever practical, enclosures shall be a manufactured item.
- All doors shall be provided with quick-release latches to secure cover.
- Panels shall be sized to adequately dissipate heat generated by equipment mounted in or on the panel.
- Enclosure shall include a backpan.
- Enclosure shall be finished in ANSI 61 gray polyester powder coating inside and out over phosphatized surfaces.
- The enclosure shall be oversized to accommodate future racks and auxiliary devices as required.
- All outdoor enclosures shall be provided with a control panel heater and ventilation fan and filter with built-in thermostat to provide adequate climate control.

##### Fabrication

Panels should be completely fabricated, and instruments installed and wired in the manufacturer's factory (where possible). All wiring shall be completed and tested prior to shipment. All external connections shall be by way of numbered terminal blocks. Panel cutouts for instruments and devices shall be cut, punched or drilled and smoothly finished with rounded edges.

## 17.20 PANEL COMPONENTS

### Part 1 - General

#### Design Requirements

All components shall be suitable for installation inside the I&C and Telemetry system panel enclosure.

### 17.20.3 Terminal Blocks

#### Part 1 - General

#### Design Requirements

Terminal blocks shall be one-piece molded plastic blocks with screw-type terminals and barriers rated for 600 volts. Terminals shall be double-sided and supplied with removable covers to prevent accidental contact with live circuits. Terminals shall have permanent, legible identification, and be clearly visible with the protective cover removed.

Fusible terminal blocks shall be provided with a LED blown fuse indicator for each terminal.

#### Part 3 - Execution

#### Installation

All wires between panel-mounted equipment and other equipment shall be terminated at terminal blocks. Switches shall be terminated at the terminal blocks with crimp-type, pre-insulated, ring-tongue lugs. Lugs shall be of the appropriate size for their terminal block screws and for the number and size of the wires terminated.

## 17.21 Power Supply and Protection

### 17.21.2 Normal Power Supply

#### Part 1 - General

#### Design Requirements

All equipment panels shall be provided with 120-volt, 60-Hz power. Make provisions for conduit entry and provide a terminal block for termination of the circuit wires. All electronic control panel components shall require a 120 VAC-24 VDC power supply. DC power supply shall be sized to provide at least 50 percent more current than the peak current demands of the control panel. DC power supply shall have UPS backup power capabilities as identified in Section 17.21.3. Protection equipment shall consist of circuit breakers and fuses to protect electrical circuits from short circuits and overloads.

#### Part 2 – Products

#### Manufacturers

DC power supplies shall be Puls Inc., Sola Inc., Allen-Bradley, or approved equal.

Fuses shall be Bussmann Manufacturing Model ABC or MDA rated for Branch circuit, or approved equal.

Circuit Breakers shall be Allen-Bradley rated for Branch circuit, or approved equal.

### **Part 3 – Execution**

#### **Construction**

Branch circuits shall be individually fused with an indication of fuse opening. All fuse holders for the panel shall be grouped on a single sub-panel. They shall be so situated that when the panel door is opened there is a clear view of the indicators and clear access for replacement of the fuses.

Provide DC power supplies as required to power instruments requiring external DC power of the appropriate voltages, with sufficient voltage regulation and ripple control to assure that the instruments being supplied can operate within their required tolerances. The power supplies at all RTUs shall include batteries for a backup power supply and charging equipment.

### **17.21.3 Backup Power Supply**

#### **Part 1 - General**

##### **Design Requirements**

All equipment panels shall have an Uninterruptable DC Power Module that interfaces with the Normal DC Power Supply. The Uninterruptable DC Power Module shall be capable of powering the control panel equipment after normal power failure. Transfer shall be a non-mechanical, non-interruptible, smooth transfer to battery backup.

Remote equipment batteries shall be sealed lead-acid batteries of sufficient ampere hour capacity to meet the above requirements.

##### **Performance Requirements**

The master console shall display power failure, and also a low battery condition alarm for the new equipment. A power failure alarm shall occur in the format currently used by the system. A low battery condition alarm shall cause the alarm indicator to flash but will not sound the audible alarm. The indicating light shall go off when the alarm condition is clear.

#### **Part 2 – Products**

##### **Manufacturers**

DC UPS equipment shall be Puls Inc., Sola Inc., Allen-Bradley, or approved equal. Backup DC batteries shall be PULS model number UZB12.261, SOLA model number SDU 24-BAT, or equal.

### **17.21.5 Line Protection Units – Low Current**

#### **Part 1 - General**

##### **Design Requirements**

The line protection unit shall isolate and protect the I&C electronics from current and voltage surges in the transmission lines. Each protection unit shall have:

- An isolation transformer with a minimum of 1,500 volts AC isolation, primary to secondary, and a minimum saturation current of 100 milliamps (ma) S.C. or as required to protect the I&C equipment from damage.
- Separate line-side and equipment-side terminal blocks.
- Two clip-mounted, replaceable gas discharge tubes rated at 90 volts striking voltage and 5,000 ampere peak pulse current capacity and suitable ground strap.

## **Part 2 - Products**

### **Manufactured Units**

The line protection unit shall be a complete unit, mounted on a separate chassis, and be field replaceable without soldering. The chassis shall be a 1/4-inch thick plate.

## **17.21.6 Line Protection Units – High Current**

### **Part 1 - General**

#### **Design Requirements**

The line protection unit shall isolate and protect the I&C electronics from current and voltage surges in the transmission lines. Each protection unit shall have:

- A minimum continuous operating current rating of 30 amps or larger as required to protect the telemetry equipment from damage.
- A minimum peak surge current rating of 80 KA.
- Separate line-side and equipment-side terminal blocks.
- LED indicator for circuit diagnostics.
- A response time less than or equal to 1 nanosecond.

The line protection unit shall be a complete unit available as a surface mount or DIN rail.

### **Part 2 - Products**

#### **Manufacturers**

The line protector shall be an Allen-Bradley Model 4983-DC120-20 or equal.

## **17.21.7 Motor Current Sensors**

### **Part 2 - Products**

#### **Manufacturers**

The motor current sensors shall be Dwyer, Model No. CCT40-100, or equal.

#### **Materials**

The current transformers shall have a selectable range of 10/20/ or 50 Amps and shall have a loop powered 4-20 mA output. One current transformer shall be installed on each pump.

## **Part 3 - Execution**

### **Installation**

One current transformer shall be installed on each pump and shall be located either below or in close proximity to the existing current transformers. The existing current transformers shall remain as they will still be connected to the existing ammeters.

## **17.22 Wire and Cable**

### **17.22.2 Wiring**

#### **Part 1 - General**

##### **References**

All electrical wiring shall be in accordance with the NEC.

##### **Design Requirements**

Wires shall be 600-volt class, PVC insulated, stranded copper and shall be the sizes required for the current to be carried but not less than No. 14 AWG conductor size.

Wires for signal circuits shall be twisted shielded pairs not smaller than No. 18 AWG.

#### **Part 3 – Execution**

##### **Installation**

All power wiring shall be supported on a sheet metal raceway or enclosed in a plastic wiring duct. Wiring for signal circuits shall be separated at least 6-inch from any power wiring.

### **17.22.3 Cables**

#### **Part 1 - General**

##### **Design Requirements**

Cables and connectors shall be industry standard, shielded, and shall be provided to connect all peripherals and equipment.

## **17.24 Switches and Relays**

### **17.24.2 Selector Switch**

#### **Part 2 – Products**

##### **Manufacturers**

*Heavy-Duty, Watertight, and Corrosion-Resistant Type:* Eaton/Cutler-Hammer, Type E34; Square D Co., Type SK; Allen Bradley, Type 800H; General Electric Co., Type CR 104P.

##### **Manufactured Units**

Selector switches shall be NEMA type 4/4X/13, corrosion-resistant/watertight/oil-tight, type selector switches with contacts rated for 10 amperes continuous at proper operating voltage. Operators shall be black knob type. Units shall have the number of positions and contact

arrangements and spring return function (if any) as shown on Plans. Units shall be single-hole mounting, accommodating panel thicknesses from  $1/16$ -inch minimums to  $1/4$ -inch maximum.

### 17.24.3 Pushbuttons

#### Part 2 – Products

##### Manufacturers

*Heavy-Duty, Watertight, and Corrosion-Resistant Type:* Eaton/Cutler-Hammer, Type E34; Square D Co., Type SK; Allen Bradley, Type 800H; General Electric Co., Type CR 104P.

##### Manufactured Units

Pushbuttons shall be NEMA type 4/4X/13, corrosion-resistant/watertight/oil-tight, type push buttons with momentary contacts rated for 10-ampere continuous at proper operating voltage. Button color shall be as specified in control panels and shall have a full guard. Pushbutton contact arrangements shall be as shown on Plans. Size of pushbuttons as indicated on the Plans.

##### Special Functions

Pushbutton for “Emergency Help” applications shall have maintained contacts and red mushroom head operators.

### 17.24.4 Panel Relays

#### Part 1 – General

##### Design Criteria

Relays shall be provided as necessary to perform switching functions required of control panels and other control circuits as shown on the Plans and described in the technical specifications. Appropriate relay type and associated contacts shall be selected based on the application from the control wiring diagrams or the functional description. Where timing relays and control relays require additional contacts, provide auxiliary control relays properly sized for the application.

All contacts and relays shall be NEMA rated and UL recognized.

The electrical life expectancy for the relay shall be over 500,000 operations at 120V AC, 10 amps; (over 200,000 operations at 120V AC, 10 amp for SPDT, 3PDT, and 4PDT). The mechanical life expectancy for the relay shall be over 50,000,000 operations.

#### Part 2 – Products

##### Manufacturers

##### Control Relays

Square D Class 8501, Type K or R; Allen Bradley 700 Type HA or HB; IDEC RH Series; or equal.

##### Time Delay and Timing Relays

Allen Bradley 700 Type HR; IDEC GE1, RTE or GT3 Series; or equal.



## Manufactured Units

### Control Relays

Relays for general purpose use shall be DPDT or 3PDT, 10 amp contacts with the appropriate coil voltage for the application. Relays shall be plug-in type with matching socket. All relays shall have LED indicators to signal when the coil is energized. Relay coils shall be rated for continuous duty.

### Time Delay Relays

Time delay relays shall be multi-function, multi-range with plug-in base, pin style terminations timing and timed out LED indicators, and calibrated scales. Relays shall have minimum 0.5 seconds to 60 minutes, 8 selectable timing ranges, 5 amp contacts. Select coil voltage for the application. Units shall be sealed to prevent entry of contamination in the form of dust, dirt, or moisture.

Appropriate relay shall be selected based on application from the control wiring diagrams.

Minimum accuracy (plus or minus) shall be as follows:

1. Repeat accuracy – ½ percent.
2. Timing change over full voltage range – ½ percent change over full temperature range.
3. Scale tolerance – 5-percent.

## Part 3 – Execution

### Installation

Provide adjustable time relays on all alarm and shut down circuits to prevent nuisance tripping of other alarm points. Time delay relays for these functions may not be shown on the Plans; however, provide as required on all circuits.

Provide additional form C contacts over and above the number indicated on the Plans for all relays provided.

120 VAC relays shall not be interchangeable with other voltages to prevent a hazardous interchange of relay voltages.

Provide DIN mounted or panel mounted type depending on application.

## 17.25 Indicating Lights and Readouts

### 17.25.2 Pilot Lights

#### Part 2 – Products

#### Manufacturers

*Heavy-Duty, Watertight, and Corrosion-Resistant Type:* Eaton/Cutler-Hammer, Type E34; Square D Co., Type SK; Allen Bradley, Type 800H; General Electric Co., Type CR 104P.

## Manufactured Units

Indicating lights shall be NEMA type 4/4X/13, corrosion resistant, water-tight, oil-tight, full voltage, push-to-test, high visibility 28 chips LED type. Pilot lights shall be rated for the proper operating voltage. Appropriate lens caps shall be provided as shown on Plans.

## 17.30 INTELLIGENT CONTROL UNITS

### 17.31.2 Programmable Logic Controller (PLC) System

#### Part 1 - General

##### Summary

Work involved in this contract includes providing new PLC equipment and programming to provide the functions shown on the Plans and described herein.

##### Performance and Design Requirements

- The PLC system modifications shall accomplish the control requirements of the loop descriptions, Plans, and Specifications.
- The design application and installation of the PLCs shall conform to NEMA ICS 1.1.
- PLC programming shall be documented.
- All PLC control system components shall be capable of meeting or exceeding electromagnetic interference tests per ANSI/IEEE C37.90.2.

#### Part 2 – Products

##### Manufacturers

PLC components added to this Contract shall be Allen-Bradley. No substitution.

Refer to project Telemetry Panel plans for specific Allen-Bradley component numbers and quantities.

##### Components

###### Input/Output (I/O) Modules

- a) Provide plug-in modular-type I/O racks with cables to connect to all other required PLC system components.
- b) Provide I/O system with:
  1. I/O solid state boards with status lights indicating I/O status and board failure.
  2. Electric isolation between logic and field device.
  3. Interchangeable boards for similar I/O type to allow substitution of operating boards for failed units by the operator.
  4. Capability of withstanding low energy common mode transient to 1500 V without failure.
  5. Incorporate noise suppression design.

6. Capable of meeting or exceeding surge-withstand capability tests, per ANSI/IEEE C37.90.1.
  7. Capable of meeting or exceeding electrical noise tests, NEMA ICS1-109.60-109.66.
- c) Discrete I/O modules:
1. Interface to ON/OFF devices.
  2. I/O status indicator on module front.
  3. Voltage rating to match circuit voltage.
  4. Output module current rating:
    - a. Match maximum circuit current draw.
    - b. Minimum 1.5 A/point for 120 V AC applications.
  5. Isolated modules for applications where one module interfaces with devices utilizing different sources of power.
  6. Individually fused outputs with blown fuse indication.
- d) Analog I/O modules:
1. Input modules to accept signals indicated on Plans or Specifications.
  2. 12-bit minimum resolution.
  3. I/O chassis supplied power for powering connected field devices.
  4. Isolated (differential) inputs and outputs.
  5. User configurable for desired fault-response state.
  6. Provide output signals as indicated on Plans and Specifications.
  7. Individual D/A converter for each output module.
  8. Individual A/D converter for each input module.

#### Data Highway Communications

1. All PLC controllers shall be capable of EtherNet/IP communications. Any additional industrial protocols shall be provided through protocol converters.

#### PLC Peripheral Devices

1. PLC Peripheral Devices

##### Graphical Operator Interface

- a. The data entry and display module shall consist of a 6-inch color screen display.
- b. The unit shall be capable of reading PLC data table register values and pre-defined messages and writing into PLC memory to modify register values.

- c. The readout module will be used as a local operator interface device for entering operational parameters and reading out process data including display of all alarms by tag number.
- d. A complete index of parameters and corresponding memory locations and a complete cross reference of alarms will be permanently attached to each PLC enclosure.
- e. The unit will be self-contained, 24 VDC powered and rated minimum NEMA 12 suitable for panel mounting.
- f. Communications will be direct with the Ethernet Switch via shielded CAT 5E Ethernet Cable.
- g. The touch screen panel shall be an Allen-Bradley PanelView Plus 7 Standard Terminal, 6.5-inch Color Display, Part Number 2711P-T6C21D8S, No Substitutions.

### **Part 3 - Execution**

#### **Installers**

Control System Integrator and programmers shall have had experience in design, installation, and start-up of at least three similar installations using the proposed hardware and software.

#### **Installation**

Provide a completely integrated distributed programmable controller system capable of analog and sequential control, data acquisition and display, alarm annunciation and communications using the PLC system. I/O cards and memory shall be added as necessary to complete work shown on the Plans and described in the specifications.

The system shall provide true distributed control wherein each PLC is an intelligent stand-alone controller programmed for the specific functions required at its respective location. Certain information in the form of control commands, interlocks and data will be passed directly between the PLCs for use in executing the local control programs.

#### Input/Output Connection Requirements

1. Make connections to I/O subsystem by terminating all field wiring on terminal blocks within the I/O enclosure.
2. Prewire I/O modules to terminal blocks.
3. Provide terminal blocks with continuous marking strip.
4. Size terminals to accommodate all active data base points and spares.
5. Provide terminals for individual termination of each signal shield.
6. Field wiring shall not be disturbed when removing or replacing an I/O module.

#### PLC Installation

1. Component placement:
  - a. Mount all components according to manufacturer's instructions.

- b. Locate incoming line devices (isolation or constant voltage transformers, local power disconnects, surge suppressors, etc.) so as to keep power wire runs within an enclosure as short as possible.
  - c. If items such as magnetic starters, contactors, relays and other electromagnetic devices are located within the same enclosure as the PLC system components, provide at least 6 inches of separation between the magnetic area and the control area.
  - d. Oversize enclosure to accommodate future racks and auxiliary devices as required.
2. Provide enclosure with a single quick disconnect of incoming power. Mount disconnect switch or breaker on enclosure exterior and label.
  3. Enclosures shall comply with these specifications.
  4. Enclosures shall be equipped with H2S inhibitor(s) suitable for the enclosed volume.

## **17.33 Network Equipment and Computers**

### **17.33.1 Industrial Network Equipment**

#### **Part 1 – General**

##### **Design Requirements**

All specified “industrial network equipment” shall comply with the following minimum specifications:

1. Rated for a 5-30VDC power supply.
2. UL listed.
3. Designed for an industrial environment.
4. Operating temperature of -40 degrees Fahrenheit to 176 degrees Fahrenheit.
5. IP66 rated water and dust resistant.
6. Control network device shall be capable of remote monitoring using OPC protocol.
7. All devices on fiber backbone shall have a minimum of two sets of transmit/receive ports.
8. Twisted pair network speed shall be a minimum of 100Base-TX.
9. Fiber optic network speed shall be a minimum of 100Base-FX.

These requirements do not apply to non-industrial network equipment.

#### **Part 2 - Products**

##### **Control Network Equipment**

Data highway communications shall be accomplished on a control network consisting of nodes, one at each PLC or computer workstation and a physical link layer consisting of cables and all interfacing hardware. Control Network equipment shall consist of the following devices.

### Unmanaged Ethernet Switch

One (1) N-Tron 308TX Ethernet Switch. No Substitutions.

## **Part 3 – Execution**

### **Installation**

All network equipment in Control Panels shall be installed as per Plans, specifications and product installation instructions. All components shall be suitable for installation in the environment where installed. All devices shall be installed as specified by the manufacturer. All devices shall be installed to be field serviceable without taking the facility out of service. Device displays shall be positioned to be easily read when viewing directly into control panels.

## **17.40 REMOTE COMMUNICATION DEVICES**

### **17.41 Radio Systems**

#### **Part 1 – General**

##### **Performance Requirements**

All components shall be suitable for installation in the environment where installed.

Provide radio communication and signal condition equipment as necessary to establish a communication link between the facilities and the master SCADA system located at the Public Works Building. Lift Station 7 shall communicate directly to the master SCADA system site.

#### **Part 2 – Products**

##### **Manufacturers**

All radio equipment shall be supplied and fabricated by the Owner's radio system integrator ACCU-COM, Inc. All radio system components shall be installed by the Contractor. The existing coaxial antenna cables, fittings, and antennas shall be replaced at the lift station. The direction and angle of the proposed antenna shall be adjusted as necessary to achieve radio communications by the Contractor. The radio system integrator shall provide direction to the Contractor for adjusting antenna. The radio system integrator shall be enjoined with the Contractor as a subcontractor. Contact information of the radio system integrator is as follows:

ACCU-COMM, Inc  
Attn: Michael Bingaman  
9504 180th Street SE  
Snohomish, WA 98296  
(360)668-6760, [mikeb@accu-comm.com](mailto:mikeb@accu-comm.com)

##### **Radio Communication Equipment**

1. One (1) CalAmp Viper SC-400 UHF RF Modem, UHF 450-512 MHz. Programmable to 25, 12.5 and 6.25 KHz bandwidth operations. No Substitutions.
2. Din-Rail mounting kit for radio.
3. One (1) CalAmp VHF50HN 100MHz-512MHz frequencies PolyPhaser.

4. RF interconnection cables as required.
5. LMR400 coaxial antenna cable with terminate N-Male and N-Female connectors for the proposed Yagi antenna. Cable shall be of length as required for connection between the antenna and the RTU.
6. Replacement Yagi antenna. Antenna shall be selected by ACCU-COMM, Inc. to match existing City standards.
7. One (1) 18-inch Pigtail cable between the CalAmp VIPER SC radio and the PolyPhaser P/N 250-0697-103. This is an RG400 TNC to N-Male cables.
8. Any other hardware, cables, or components necessary to provide a completely functional system.

### **Part 3 – Execution**

#### **Installation**

The radio system integrator shall provide all field programming, startup and testing services for the radio equipment.

All radio equipment shall be installed as per Plans, specifications, and product installation instructions by the Contractor. All devices shall be installed as specified by the Manufacturer.

## **17.50 SENSORS AND CONTROLS**

### **17.53 Environmental Sensors and Controls**

#### **17.53.4 Temperature Transmitter**

##### **Part 1 – General**

##### **Design Requirements**

All components shall be suitable for installation in the environment where installed.

##### **Part 2 – Products**

##### **Manufacturers**

Dwyer, Model No. RHP-W, or equal.

##### **Materials**

The temperature transmitter shall measure room temperature and shall be a wall mounted 4-20 mA loop power device with 2 percent accuracy.

##### **Part 2 – Products**

##### **Installation**

Furnish and install temperature transmitter as shown on the Plans.

## **17.90 TESTING, STARTUP, AND TRAINING**

### **17.90.1 Common Work for Testing, Startup, and Training**

#### **Part 1 – General**

##### **Summary**

Total system hardware start-up is the responsibility of the Control System Integrator.

##### **Maintenance**

The Control System Integrator shall be solely and completely responsible for all hardware maintenance of the system from time of start-up to the date of acceptance, by formal action of the Owner, of all work under the contract. The Control System Integrator shall perform all such work required or considered to be required by the Owner to cause and maintain proper operation of the system and to properly maintain the system.

##### **Warranty**

The Contractor shall cause the Control System Integrator to make any and all repairs, replacements, modifications and adjustments required to eliminate any and all defects in design, materials and workmanship which are disclosed within the one year guarantee period. The Control System Integrator shall begin all repairs, replacements, modifications and adjustments within twenty-four (24) hours of notification by telephone by the Owner and shall complete such repairs, replacements, modifications and adjustments within forty-eight (48) hours of notification. Should the Control System Integrator fail to begin the work within 24 hours or complete the work within 48 hours, the Owner may proceed to undertake or complete the work. In such event, the Contractor and his surety shall be liable for all costs incurred by the Owner.

#### **Part 3 – Execution**

##### **Field Quality Control**

###### **Equipment Manufacturer's Support**

1. The Control System Integrator shall pay for services of equipment manufacturer's field service representative(s) to:
  - a. Inspect equipment covered by these Specifications.
  - b. Supervise adjustments and installation checks.
  - c. Conduct start-up of equipment and perform operational checks.
  - d. Provide Owner with a written statement that manufacturer's equipment has been installed properly, started up and is ready for operation by Owner's personnel.

##### **Repairs**

The Control System Integrator shall correct all deficiencies and defects and make any and all repairs, replacements, modifications, and adjustments as malfunctions or failures occur.



The Contractor and the Control System Integrator shall anticipate that the Owner may delay acceptance of all work under the contract if, in the judgment of the Owner, malfunctions or failures in operation of the control system repeatedly occur after start-up. Both the Contractor and the Control System Integrator shall not be entitled to an extension of time or to any claim for damages because of hindrances, delays or complications caused by or resulting from delay by the Owner in accepting the work because of malfunctions or failures in operation of the control system.

## **17.91 Tests and Inspections**

### **Part 1 - General**

#### **Summary**

Materials, equipment, and construction included under this specification shall be inspected in accordance with the specifications. Testing shall be performed by the Control System Integrator in accordance with Division 16, and this and subsequent sections of this division. Testing shall be required to determine if installed equipment and system(s) will operate in the manner in which they are intended to operate. The decision of the Owner upon the acceptability of the test procedures and conformance shall be final. The work will not be accepted until all testing has been satisfactorily performed.

#### **Scheduling**

The Contractor shall prepare factory and field test procedures to demonstrate conformance of the complete system to this specification. The Contractor shall submit the detailed test procedures within four weeks after the notice to proceed for the Engineer's review and approval.

The Contractor shall furnish all labor, materials, tools, equipment, instruments and services necessary to perform all specific functional testing of all installed equipment and systems at no additional cost.

The Control System Integrator and Contractor shall notify the Owner and Engineer (Control System Programmer) of the factory testing date 30 days before testing.

The Contractor and Control System Integrator shall include in the schedule 5 consecutive working days as part of the factory testing for the Control System Programmer to test the control system software with the hardware supplied by the Control System Integrator at the Control System Integrator's shop.

The Control System Integrator and Contractor shall submit to the Engineer (Control System Programmer) a detailed field testing schedule identifying each day that both the Control System Integrator and Control System Programmer will need to be on site for field testing of equipment. A preliminary schedule shall be submitted to the Engineer for review 60 days before testing. A final schedule shall be submitted to the Engineer for review 30 days before testing.

The Contractor and Control System Integrator shall include in the construction schedule 5 consecutive working days at each site between the completion of field testing and the startup phase for the Control System Programmer to perform field software testing. Startup shall not proceed until the software field testing is complete.

## Part 2 – Products

### Factory Testing

All factory testing of control panels and computer systems shall be performed at the Control System Integrator's shop.

The completed control system shall be tested in the shop by the Control System Integrator and the Control System Programmer. All motor control centers and VFD's supplied by the Control System Integrator shall be interconnected with the control system and powered with rated incoming voltage. Testing shall be conducted in two phases. The initial hardware testing shall include, but not be limited to, operation of all input and output (I/O) points, control devices and motor controllers. The subsequent testing shall include, but not be limited to, testing of RTU programming and Operator Interface provided by the Control System Programmer.

The initial hardware testing of the control system shall include the following:

1. The entire assembled panels shall be meggered and tested to be free from grounds and shorts.
2. Energize each discrete input and output and simulating each analog input and output using a loop simulator and calibrator. Circuits not energized shall be tested for continuity. Discrete input signals shall be tested in both the "on" and "off" state. Analog signals shall be tested at a minimum of three values (4 mA, 12 mA, and 20 mA). The test results shall be documented by the Control System Integrator in checklist format. The final test results shall be signed by both the Engineer and Control System Integrator prior to shipment of equipment to the job site.
3. Provide signal generators, multimeters, and other test equipment as required to verify proper operation of the assembled panels.
4. The Control System Integrator shall interconnect the control panels with the motor control centers and VFD's for both hardware and software testing phases. Control panels shall initially be hardware tested in one group. Similarly, the motor control centers and VFD's shall be hardware tested in another group. After both groups of hardware are confirmed to be operating correctly, the Control System Integrator shall interconnect the equipment with Ethernet cables and analog and discrete wiring as shown on the Plans. The equipment shall remain connected for the remainder of the factory testing period.
5. Correct, replace, or repair control panel and motor control center wiring, and/or components until testing demonstrates proper operation. Control panels and motor control centers shall not be shipped to the job site until testing has demonstrated complete operation of the panels.
6. Provide updated and complete as-built drawings for the control panels and motor control centers at the time of final factory testing. The Engineer shall review the drawings against the panel construction at the time of final factory testing. Drawings which do not reflect the actual construction of the panel shall be revised and reviewed again by the Engineer. As-built drawings that require revisions shall be submitted to the Engineer for review prior to shipment of equipment to the job site. This review

process shall be repeated as necessary so that as-built drawings reflect the actual construction of the panels and motor control centers at the time of shipment. Panels and motor control centers shall not be shipped to the job site until the as-built drawings are updated, complete, and reflect the actual as-shipped status of the equipment.

Upon completion of the initial hardware testing, Control System Programmer shall conduct software testing for final inspection by the Owner. The Control System Integrator shall provide for time, equipment and support in their shop for Control System Programmer to completely demonstrate the functions of the entire control system. All control functions and all status and alarm monitoring and indication shall be demonstrated under simulated operating conditions. Simulating equipment shall be provided and wired into the control system for this testing. Testing shall be continued for the time period required by the Owner to observe and verify any revisions and as described above in the scheduling portion of this specification.

### **Part 3 – Execution**

#### **Field Quality Control**

Following installation by the Contractor, the Control System Integrator will verify the correctness of the interconnecting wiring and energize all control equipment in the field. Each point at the controller(s) shall be checked for proper functional operation through communication with the central computer.

#### **Field Tests**

The Control System Integrator in conjunction with the Contractor shall conduct field tests of all panels, motor control centers, VFD's, and instrumentation in the presence of the Engineer after installation of the equipment at the site. Testing shall be conducted by physically actuating signaling devices, installing temporary jumpers, or artificially imposing signals on the field wiring. This shall be done to establish proper operation of the field devices, the integrity of the field wiring, and the proper connection of field devices to the panels. The Contractor and Control System Integrator shall coordinate with the Engineer to provide for as complete testing of the control system as is practical prior to placing the equipment on line for actual control and monitoring. The Contractor and Control System Integrator shall make corrections or repairs to the wiring and/or devices as necessary to provide proper operation of the system.

After the initial testing is complete, commissioning shall be accomplished by the Control Systems Integrator, Control System Programmer, and Contractor, with the Owner and Engineer present. Commissioning shall include operation and verification of all control components and features of the entire control system. Each function shall be demonstrated to the satisfaction of the Owner.

#### **Repairs**

Should any part of the system fail during the test, the test shall be rescheduled and repeated to the satisfaction of the Owner after repairs.

## 17.92 Startup

### Part 1 – General

#### Summary

All testing, startup and operation shall not be cause for claims for delay by the Contractor, and all expenses accruing therefrom shall be deemed to be incidental to this contract. The Contractor shall make arrangement for all materials, supplies and labor necessary to efficiently complete the testing, startup and operation.

Startup shall consist of testing, by a simulated operation, all operational equipment and controls. The purpose of these tests shall be to check that all equipment will function under operating conditions, that all interlocking controls and sequences are properly set, and that the facility will function as an operating unit.

#### Scheduling

Factory representatives of all major units shall be present for the startup phase. The test shall continue until it is demonstrated that all functions of controls and machinery are correct.

### Part 3 - Execution

#### Field Quality Control

When the installation of the Control System is substantially complete, the Contractor shall commence with calibration and field testing. Testing shall determine that all system components connect up correctly to each other so that the system works as designed. Refer to section 17.91 for field testing requirements.

All components of the control system shall be calibrated by the Control System Integrator after completion of installation. Each component shall be adjusted to be within the Manufacturer's required range and for the specific application.

Components that cannot be properly calibrated or that are found to exceed the Manufacturer's specified range or accuracy shall be removed and replaced at no additional cost to the Owner.

The control system shall be placed into operation by the Control Systems Integrator and Control System Programmer.

The Control System Integrator shall calibrate all instruments, indicators, recorders, loops, etc. and shall provide a five-point calibration test results sheet for each calibrated instrument supplied by the Control System Integrator. The five-point calibration shall include one point at: Minimum input range value, Maximum input range value, Midrange input value, no other point less than 25 percent of span to any other point. Test forms shall identify each instrument tested, input conditions vs. output signal results in tabulated form, and shall be submitted to the Engineer prior to final commissioning.

#### Repairs

All deficiencies observed during the start-up will be corrected by the Contractor.

## **17.93 Training**

### **Part 1 – General**

#### **Submittals**

Submit index of all training offered by PLC system equipment manufacturers including operation and maintenance.

The Control System Integrator shall prepare and assemble specific instruction materials for each training session and shall supply such materials to the Owner at least 2 weeks prior to the time of the training.

The Control System Programmer will provide additional training that is separate from this contract.

### **Part 3 – Execution**

#### **Hands-On Training**

The Control System Integrator shall conduct specifically organized training sessions in operation and maintenance of the control system for personnel employed by the Owner. The training sessions shall be conducted to educate and train the personnel in maintenance and operation of all components of the control system. Training shall include, but not be limited to, the following:

1. Preventative maintenance procedures
2. Trouble-shooting
3. Calibration
4. Testing
5. Replacement of components

At least two separate training sessions, each at least 4 hours in duration, shall be conducted at the facility after start-up of the system.

## **17.94 Documentation**

### **17.94.2 Operations and Maintenance Manuals**

#### **Part 1 – General**

##### **Summary**

Two types of operation and maintenance manuals (O&M) will be required for the contract:

1. General manuals for use by the Water Department staff for daily operation, maintenance and troubleshooting.
2. Technical manuals for use by trained electronics technicians for technical and “board level” maintenance and repair.

## Submittals

Prior to the receipt of payment for more than 50 percent of the work, the Contractor shall deliver to the Owner five sets of acceptable manufacturer's operating and maintenance instructions covering each piece of mechanical and electrical equipment, or equipment assembly, furnished under this contract. Each set of instructions shall be bound into multiple volumes; each volume to be complete with an index and bound in a suitable hard-cover binder. Manuals shall be assembled and indexed so that information on each piece of equipment can be readily found. Any additional operating and maintenance instructions from the Control Systems Programmer will be submitted separately.

## Quality Assurance

Manuals shall be purposefully made for this installation, and general manuals which are vague or have limited applicability will not be accepted. The manuals shall be written in a non-technical format suitable for reading by water system operators with no previous automatic control equipment experience. The decision of the Owner on the acceptability of the manual shall be final.

## Part 2 – Products

### Materials

The Control System Integrator shall prepare and assemble detailed operation and maintenance manuals in accordance with the project general requirements. The manuals shall include, but not be limited to, the following:

1. Name, location and phone number of nearest supplier and spare part warehouse.
2. Step by step operating procedures.
3. Narrative of overall system performance and operation.
4. Listing of all equipment setpoints.
5. Preventative maintenance procedures
6. Trouble-shooting of master and remote equipment.
7. Calibration
8. Testing
9. Replacement of components
10. System schematics / shop drawings
11. As-built elementary and one-line diagrams
12. Catalog data and complete parts list for all equipment and control devices
13. Listing of recommended spare parts.
14. Listing of recommended maintenance tools and equipment.
15. Warranties.
16. Disassembly and reassembly instructions.

All plans shall be provided on hard copy and in electronic form on disk. Electronic drawing files shall be provided in AutoCAD .DWG format with all “xrefs” bound. If “xrefs” are not bound, all “xref”.DWG files shall be provided unlinked with instructions to reestablish the links. Files shall be in AutoCAD 2010 or later format.

**DIVISION 18**  
**MEASUREMENT AND PAYMENT**



## Division 18

# Measurement and Payment

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### **18.0 GENERAL**

It is the intention of these specifications that performance of work under bid items shall result in complete construction, in proper operating condition, of improvements identified in these written specifications and accompanying plans. Work and material not specifically listed in the proposal but required according to the plans and specifications and general practice, shall be included in Contractor's bid price.

#### **Bid Item 1 – Mobilization, Demobilization, Site Preparation, and Cleanup**

Lump sum price covers complete cost of furnishing, installing and testing, complete and in-place, all work and materials necessary to: move and organize equipment and personnel onto the job site; secure job site; provide and maintain necessary support facilities; obtain all necessary permits and licenses; prepare site for construction operations; maintain site and surrounding areas during construction; provide system testing, move all personnel and equipment off site after contract completion, and provide as-built data; cleanup site prior to final acceptance; and accomplish all other items of work not specifically listed in other divisions. Payment shall be lump sum.

No more than 50-percent of bid amount for this item will be paid before final payment request, and this bid amount may not be more than 10-percent of value of contract.

#### **Bid Item 2 – Electrical Installation at Lift Station No. 7**

The lump sum price shall cover the complete cost of providing all labor, materials, and equipment necessary for the electrical work shown on the Plans and detailed in the contract specifications for the Lift Station No. 7 telemetry panel and level transmitter installation.

Payment shall be lump sum.

#### **Bid Item 3 – Automatic Control at Lift Station No. 7**

The lump sum price shall cover the complete cost of providing all labor, materials, and equipment necessary for the telemetry panel equipment and instrumentation shown on the Plans and detailed in the contract specifications for Lift Station No. 7.

Payment shall be lump sum.